Department of Environmental Quality
Division of INL Oversight
and Radiation Control

ENVIRONMENTAL SURVEILLANCE PROGRAM QUARTERLY DATA REPORT

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State of Idaho
Division of INL Oversight and Radiation Control

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Table of Acronyms

ANL-W - Argonne National Laboratory West
BBWI - Bechtel BWXT Idaho, LLC
CERCLA - Comprehensive Environmental Response Compensation and Liability Act
CFA - Central Facilities Area
DEQ-INL - The State of Idaho, Division of Idaho National Laboratory Oversight and Radiation Control
DOE - U.S. Department of Energy
EIC - electret ionization chamber
EML - Environmental Monitoring Laboratory
EPA - Environmental Protection Agency
ESER - Environmental Surveillance Education and Research Program (SM Stoller)
ESP - Environmental Surveillance Program
HPIC - high-pressure ion chamber
LLD - lower limit of detection
IBL - Idaho Bureau of Laboratories
INEEL - Idaho National Engineering & Environmental Laboratory
INTEC - Idaho Nuclear Technology and Engineering Center
LSC - liquid scintillation counting
µg/L - micrograms per liter
mg/L - milligrams per liter
mR/hr - milliRoentgen per hour
µR/hr - microRoentgen per hour
MCL - maximum contaminate level
MDA - minimum detectable activity
MDC - minimum detectable concentration
NIST - National Institute of Standards and Technology
nCi/L - nanocuries per liter
NOAA - National Oceanic and Atmospheric Administration
NRF - Naval Reactors Facility
pCi/L - picocuries per liter
pCi/m^3 - picocuries per cubic meter
PM_{10} - particulate matter with aero-dynamic diameter less than or equal to 10 micrometers
PCE - perchloroethene
QAPP - Quality Assurance Program Plan
QA/QC - Quality Assurance/Quality Control
RCRA - Resource Conservation and Recovery Act
RPD - relative percent difference
RWMC - Radioactive Waste Management Complex
SD - standard deviation
SMCL - secondary maximum contaminant level
TAN - Test Area North
TCE - trichloroethene
TDS - total dissolved solids
TMI - Three Mile Island
TSP - total suspended particulate
TSS - total suspended solids
USGS - U.S. Geological Survey
VOC - volatile organic compound
WLAP - Wastewater Land Application

Introduction

The state of Idaho, Division of Idaho National Laboratory Oversight and Radiation Control (DEQ-INL) Environmental Surveillance Program (ESP) is conducted at locations on the INEEL, on the boundaries of the INEEL, and at distant locations to the INEEL in accordance with accepted monitoring procedures and management practices. This program is designed to provide the people of the state of Idaho with independently evaluated information about the impacts of the Department of Energy's (DOE) activities in Idaho.

The primary objective for DEQ-INL's ESP is to maintain an independent environmental monitoring and verification program designed to verify and supplement DOE's data and programs. This program is also used to provide the citizens of Idaho with information that has been independently evaluated to enable them to reach informed conclusions about DOE activities in Idaho and potential impacts to public health and the environment.

Results of the ESP are published using two distinct reporting formats: quarterly data reports and an annual ESP report. The annual ESP report is designed for a more broad audience and summarizes the results of the ESP for the previous four quarters. The annual report's primary emphasis is to focus on trends, ascertain the impacts of DOE operations on the environment, and confirm the validity of DOE monitoring programs. This quarterly report is designed to provide the mechanism to document the results of the ESP on a quarterly basis and provide detailed data to those who wish to "see the numbers." It is organized according to the media sampled and also provides a quality assurance assessment.

Air and Precipitation Monitoring Results

The ESP operated eight air monitoring stations on and near the INEEL as well as two monitoring stations distant from the INEEL during the fourth quarter, 2004 (**Figure 1**). These stations employed instrumentation for collecting airborne particulate matter (TSP and PM_{10}), gaseous radioiodine, precipitation, and water vapor for tritium analysis (**Table 1**). The Shoshone-Bannock Tribes operated an air monitoring station located at Fort Hall. The Fort Hall station uses identical instrumentation and sampling protocol as the ten stations operated by the ESP. The DEQ-INL reports the Fort Hall station data as an additional background site.

The high-volume total suspended particulate (TSP) air sampler is the DEQ-INL's primary air sampler. During the fourth quarter of 2004, two PM_{10} samplers collected supplementary air data, along with radioiodine, at Mud Lake and Atomic City.

Weekly gross alpha and gross beta radioactivity results for filters from the TSP samplers are presented in **Appendix A** and summarized in **Table 2**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity observed historically.

Weekly gross alpha and gross beta radioactivity results for the PM_{10} particulate air filters are presented in **Appendix B** and summarized in **Table 3**. Gross alpha and gross beta radioactivity concentrations reported from the particulate samples were within the range of expected values for naturally occurring radioactivity.

Composites of filters collected using TSP and PM_{10} samplers during the course of a calendar quarter are analyzed using gamma spectroscopy. Typically, gamma spectroscopy results are only reported when exceeding a minimum detectable activity (MDA) or minimum detectable concentration (MDC). Gamma

spectroscopy results for the fourth quarter of 2004 for TSP filters are presented in **Table 4** and gamma spectroscopy results for PM_{10} filters are presented in **Table 5**. The only reported gamma-emitting radionuclide was beryllium-7, a naturally occurring, cosmogenic radionuclide.

No radioactive isotopes of iodine, specifically iodine-131, were detected on the weekly charcoal cartridges.

Atmospheric moisture samples were collected at eleven locations and analyzed for tritium. Atmospheric tritium concentrations were determined using the amount of tritium measured in the atmospheric moisture collected, the quantity of atmospheric moisture collected, and the volume of air sampled. Reported values are the result of either a single sample or a weighted mean when more than one atmospheric moisture sample was collected during the calendar quarter. Atmospheric tritium was detected at the Experimental Field Station during the fourth quarter of 2004. The detected tritium levels were less than 1 percent of the action levels established by DEQ-INL. The TMI-2 fuel currently stored at INTEC is the likely source for the atmospheric tritium observed. No atmospheric tritium was measured at offsite locations during the fourth quarter of 2004. Average atmospheric tritium concentrations are presented in **Table 6**.

Precipitation samples were collected at six monitoring locations during the fourth quarter of 2004. Precipitation samples are analyzed for tritium and gamma-emitting radionuclides. Tritium and gamma-emitting radionuclides were below minimum detectable concentration in precipitation collected during the fourth quarter of 2004. Tritium and cesium-137 analysis results are presented in **Table 7**. Reported values are either the result of a single sample or a weighted mean when more than one precipitation sample was collected during the calendar quarter.

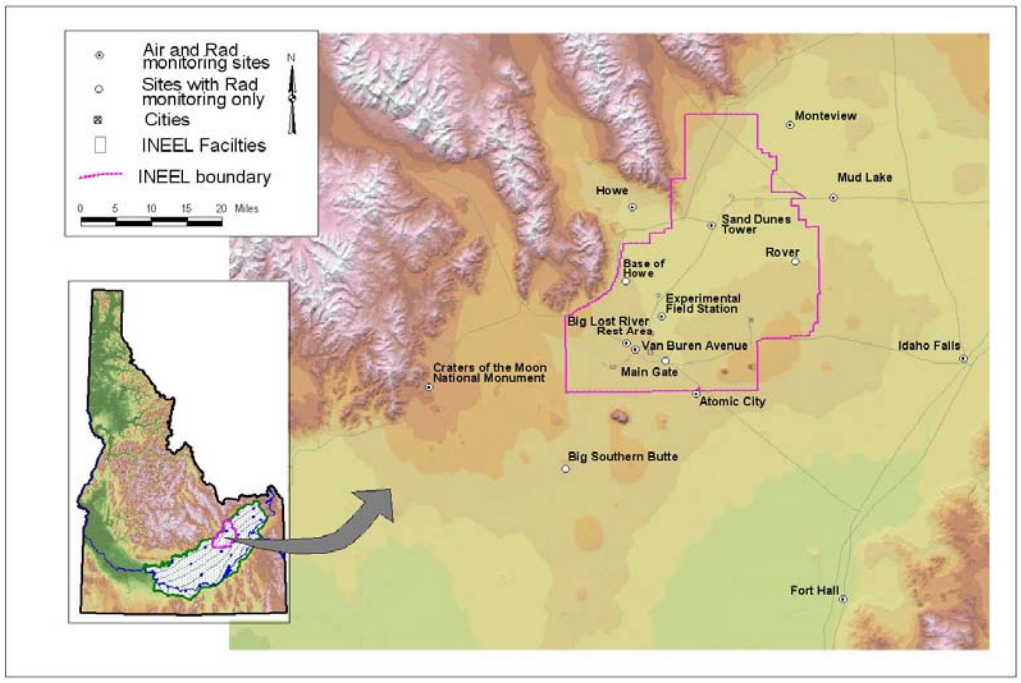

Figure 1. Air and radiation monitoring sites.

Table 1. Sampling locations and sample type.

Station Locations	Sample type[1]				
	PM_{10}	TSP	Radioiodine	Water Vapor	Precipitation
On-site Locations					
Big Lost River Rest Area		☐	☐	■	■
Experimental Field Station		☐	☐	■	
Sand Dunes Tower		☐	☐	■	
Van Buren Avenue		☐	☐	■	
Boundary Locations					
Atomic City	☐	☐	☐	■	■
Howe		☐	☐	■	■
Monteview		☐	☐	■	■
Mud Lake	☐	☐	☐	■	■
Distant Locations					
Craters of the Moon		☐	☐	■	
Fort Hall[2]		☐	☐	■	
Idaho Falls		☐	☐	■	■

[1] ☐ Samples collected weekly; ■ Samples collected quarterly.
[2] Operated by Shoshone-Bannock Tribes.

Table 2. Range of alpha and beta concentrations for TSP filters, fourth quarter, 2004. Concentrations are reported in 1x 10^{-3} pCi/m^3.

Station Location	Concentration	
	Gross Alpha	Gross Beta
On-Site Locations		
Big Lost River Rest Area	0.2 - 1.7	13.9 - 49.5
Experimental Field Station	0.2 - 1.8	14.1 - 52.9
Sand Dunes Tower	0.2 - 1.3	13.0 - 43.7
Van Buren Avenue	0.2 - 1.8	15.5 - 54.1
Boundary Locations		
Atomic City	0.4 - 2.1	17.9 - 59.2
Howe	0.2 - 1.8	15.2 - 54.7
Monteview	0.4 - 1.3	9.1 - 36.8
Mud Lake	0.3 - 1.7	13.0 - 49.6
Distant Locations		
Craters of the Moon	0.0 - 1.4	10.9 - 41.5
Fort Hall[1]	0.3 - 1.9	10.9 - 38.3
Idaho Falls	0.1 - 1.4	14.3 - 43.5

[1] Operated by Shoshone-Bannock Tribes.

Table 3. Range of alpha and beta concentrations for PM_{10} filters, fourth quarter, 2004. Concentrations are reported in 1x 10^{-3} pCi/m^3.

Station Location	Concentration	
	Gross Alpha	Gross Beta
Boundary Locations		
Atomic City	0.1 - 2.4	22.9 - 79.6
Mud Lake	0.3 - 2.7	19.6 - 79.5

Table 4. Gamma spectroscopy analysis data of TSP filters, composite sample, fourth quarter, 2004. Concentrations are reported in 1 x 10^{-3} pCi/m^3 with associated uncertainty (**±** 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
On-site Locations			
Big Lost River Rest Area	61	3	<MDC
Experimental Field Station	55	3	<MDC
Sand Dunes Tower	48	3	<MDC
Van Buren Avenue	68	4	<MDC
Boundary Locations			
Atomic City	63	3	<MDC
Howe	59	3	<MDC
Monteview	46	3	<MDC
Mud Lake	50	3	<MDC
Distant Locations			
Craters of the Moon	48	3	<MDC
Fort Hall[1]	47	3	<MDC
Idaho Falls	61	3	<MDC

[1] Operated by Shoshone-Bannock Tribes.

Table 5. Gamma spectroscopy analysis data of PM_{10} filters, composite sample, fourth quarter, 2004. Concentrations are reported in 1 x 10^{-3} pCi/m^3 with associated uncertainty (**±** 2 SD), minimum detectable concentration (MDC), and correspond to filter composites collected during the calendar quarter.

Station Location	Naturally Occurring Radionuclide Beryllium-7		Man-Made Gamma Emitting Radionuclides
	Concentration	± 2 SD	
Boundary Locations			
Atomic City	75	4	<MDC
Mud Lake	68	4	<MDC

Table 6. Tritium concentrations from atmospheric moisture, fourth quarter, 2004. Concentrations are reported in pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Station Location	Tritium		
	Concentration	± 2 SD	MDC
On-site Locations			
Big Lost River Rest Area	0.16	0.21	0.36
Experimental Field Station	0.30[1]	0.14	0.21
Sand Dunes Tower	0.24	0.26	0.43
Van Buren Avenue	0.42	0.29	0.43
Boundary Locations			
Atomic City	0.01	0.25	0.44
Howe	0.07	0.26	0.43
Mud Lake	0.01	0.26	0.45
Monteview	0.11	0.25	0.44
Distant Locations			
Craters of the Moon	0.13	0.15	0.26
Fort Hall	0.03	0.30	0.51
Idaho Falls	0.06	0.28	0.47

[1] The reported concentrations exceed the MDC.

Table 7. Tritium and cesium-137 concentrations from precipitation, fourth quarter, 2004. Concentrations are reported in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Station Location	Tritium			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
On-site Locations						
Big Lost River Rest Area	60	80	130	-1.1	1.7	3.0
Boundary Locations						
Atomic City	70	80	120	1.0	1.7	2.8
Howe	37	73	120	0.5	1.5	2.5
Monteview	80	80	120	0.6	1.6	2.7
Mud Lake	60	80	120	0.0	1.4	2.4
Distant Locations						
Idaho Falls	98	80	120	0.7	1.4	2.3

Environmental Radiation Monitoring Results

The ESP operated 14 environmental radiation stations during the fourth quarter of 2004 **(Figure 1)**. Each of these stations is instrumented with an electret ionization chamber (EIC), and 11 of the stations also have high-pressure ion chambers (HPIC) **(Table 8)**. The Shoshone-Bannock Tribes operate an additional environmental radiation station at Fort Hall equipped with both an EIC and HPIC. The DEQ-INL reports these results.

HPICs are instruments capable of real-time measurements, and therefore can detect small changes in gamma radiation levels over time. Since HPICs offer real-time gamma radiation measurement and data acquisition, DEQ-INL collects this information electronically and provides graphed data via the world wide web at www.idahoop.org. EICs are a passive integrating system that provides a cumulative measure of environmental gamma radiation exposure. DEQ-INL compared the exposure rates measured by EICs and HPICs and observed that the data correlated very well from both measurement methods; although, EICs tend to over respond by approximately 20 percent, accounting for the slight differences observed between the two measurements. A complete analysis of the radiation measuring devices can be found in *A Comparison of Three Methods for Measuring Environmental Radiation*, Moser, Kristi, Idaho State University, M.S.Thesis, 2002. Each system is used by DEQ-INL to measure gamma radiation for various radiological monitoring objectives. EICs offer an inexpensive methodology to measure gamma radiation over a wide area, particularly in regions which do not have a power source. EICs can also provide valuable gamma radiation data in the event of an emergency. It is because of this reason that EICs are also deployed at 78 locations by DEQ-INL in a widespread network around the INEEL measuring general background radiation. This information is tabulated in **Appendix C.**

Table 9 lists the average radiation exposure rates measured by the HPICs for the quarter. Exposure rates were within the expected range of values for historical background radiation. **Table 10** lists the EIC monitoring results for fourth quarter, 2004.

Table 8. Summary of instrumentation at radiation monitoring stations.

Station Location	Instrument Type	
	HPIC	EIC
Onsite Locations		
Base of Howe	■	■
Big Lost River Rest Area	■	■
Experimental Field Station		■
Main Gate	■	■
Rover	■	■
Sand Dunes Tower	■	■
Van Buren Avenue		■
Boundary Locations		
Atomic City	■	■
Big Southern Butte	■	■
Howe	■	■
Monteview	■	■
Mud Lake	■	■
Distant Locations		
Craters of the Moon		■
Fort Hall[1]	■	■
Idaho Falls	■	■

[1] HPIC operated by Shoshone-Bannock Tribes with the EIC maintained by DEQ-INL.

Table 9. Average gamma exposure rates for fourth quarter 2004, from HPIC network. These rates are expressed in µR/hr.

Station Location	Exposure Rate	
	Quarterly Average	± 2 SD
Onsite Locations		
Base of Howe	12.5	1.1
Big Lost River Rest Area	15.1	1.8
Main Gate	14.2	0.8
Rover	14.2	0.6
Sand Dunes Tower	14.1	0.8
Boundary Locations		
Atomic City	13.2	0.8
Big Southern Butte	13.4	4.1
Howe	12.6	0.8
Monteview	12.1	0.6
Mud Lake	12.7	0.5
Distant Locations		
Fort Hall[1]	12.1	0.5
Idaho Falls	11.9	0.6

[1] Operated by Shoshone-Bannock Tribes.

Table 10. Electret Ionization chamber (EIC) cumulative average exposure rates for fourth quarter, 2004. These rates are expressed in µR/hr.

Station Location	Exposure Rate	
	Total	± 2 SD
Onsite Locations		
Base of Howe	18.0	2.2
Big Lost River Rest Area	20.7	2.0
Experimental Field Station	21.0	2.0
Main Gate	21.1	2.0
Rover	19.0	2.1
Sand Dunes Tower	18.2	1.9
Van Buren Avenue	21.0	2.0
Boundary Locations		
Atomic City	16.7	1.9
Big Southern Butte	16.9	2.1
Howe	17.4	1.9
Monteview	19.2	1.9
Mud Lake	19.1	1.9
Distant Locations		
Craters of the Moon	18.5	1.9
Fort Hall	18.9	1.9
Idaho Falls	17.4	1.9

Water Monitoring & Verification Results

Water Monitoring

Water monitoring sites are sampled for the primary purpose of examining trends of key INEEL contaminants and of general groundwater quality indicators. These sites are grouped by location; on the INEEL or its boundary, offsite and distant from the INEEL, and surface water sites. Sites are typically co-sampled with the USGS or DOE's environmental monitoring contractor. Eighteen water monitoring locations were sampled during the fourth quarter of 2004, twelve locations on or bounding the INEEL , five locations offsite or distant from the INEEL, and one surface water site. (**Figure 2**).

Gross alpha radioactivity was not detected in any samples, while gross beta radioactivity was detected in samples from nine onsite and boundary locations and all samples from offsite and distant locations for the current calendar quarter. Detectable gross beta activity ranged from 1.7 ± 1.1 to 34.3 ± 1.7 pCi/L for onsite and boundary locations and 1.7 ± 0.9 to 4.8 ± 1.2 pCi/L for offsite and distant locations. The concentrations of gross beta activity were consistent with historical results and were within expected ranges. No man-made gamma emitting radionuclides were identified via gamma spectroscopic analysis. Results for gross alpha, gross beta, and man-made gamma emitting radioactivity are shown in **Table 11.**

Gross beta analyses are also conducted as a screening tool for beta emitting radionuclides potentially released due to INEEL operations. In the event of suspect, known high, or unexpected levels of gross beta radioactivity, samples may also be analyzed for technetium-99 and strontium-90.

Five locations were sampled for technetium-99, with concentrations from all sites exceeding the detection level of 0.2 - 0.3 pCi/L. Technetium-99 was released to the environment at the INEEL by reprocessing spent nuclear fuel, and does not occur naturally in groundwater of the Eastern Snake River Plain. The concentration reported for the sample from Mud Lake Water Supply (0.3 ± 0.1 pCi/L) slightly exceeded the criteria for detection. Other man-made INEEL waste products which travel in groundwater in the same way as technetium-99 were not found in samples from this location. DEQ-INL and ISU-EML are investigating this result and other recent technetium-99 results to ensure that uncertainty due to possible errors in the sample collection, handling, or the analysis process is being properly accounted for in sample results.

Strontium-90 was detected in one of the five samples, USGS-112 (13.1 ± 3.2 pCi/L), an area of known INEEL contamination. The detectable values for strontium-90 ranged from about 0.6 to 0.7 pCi/L. The EPA maximum contaminant level (MCL) for strontium-90 is 8 pCi/L. Results for technetium-99 and strontium-90 are found in **Tables 12** and **13,** respectively.

Using the standard analytical method, tritium was detected in onsite and boundary samples (**Table 14**). Onsite and boundary sample results with detectable tritium ranged from 1050 ± 110 to 6,960 ± 220 pCi/L. Water samples with tritium concentrations not measurable using the standard method (MDC of 160 pCi/L) are analyzed using an electrolytic enrichment method with a much lower MDC of 10 to 14 pCi/L. The analytical results for these samples are presented in **Table 15**. Tritium was detected in samples on and offsite using the electrolytic enrichment method, and ranged from 8 ± 5 pCi/L to 1,235 ± 24 pCi/L. All results were within their expected ranges and were below the MCL for tritium of 20,000 pCi/L.

Water samples were also analyzed for metals and the results are shown in **Table 16.** Barium concentrations ranged from 22 to 120 µg/L and were less than the MCL of 2,000 µg/L. Detectable chromium concentrations ranged from 7 to14 µg/L, which are well below the MCL of 100 µg/L. Samples

collected from Site 14 and USGS-125 contained 6 and 10 µg/L of manganese, respectively. The recommended drinking water secondary maximum contaminant level (SMCL) for manganese is 50 µg/L. Lead was not detected in any samples. Zinc was detected at six of the locations and ranged from 6 to 450 µg/L, all less than the SMCL of 5,000 µg/L.

Common ion and nutrient results are shown in **Table 17**. All common ion results fall with in the expected ranges. Samples collected for nitrogen at CFA 2 and USGS-112 contained 2.96 and 2.05 mg/L, respectively. Typical background nitrogen concentrations observed by DEQ-INL are less than 2 mg/L; however, these results are below the nitrogen MCL of 10 mg/L. All other nutrient samples were within expected ranges.

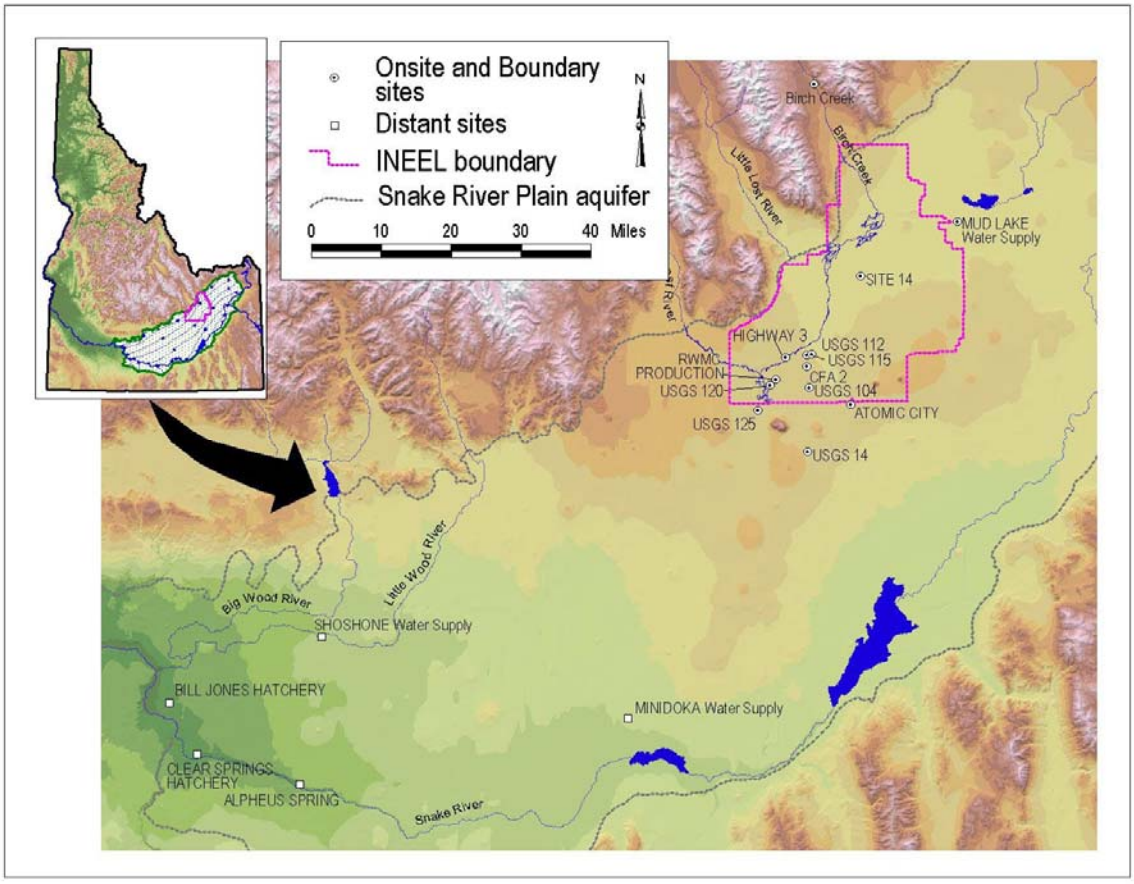

Figure 2. Water monitoring locations for fourth quarter 2004.

Table 11. Alpha, beta, and gamma concentrations[1] for water monitoring samples, fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made gamma-emitting radionuclide Cesium-137
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration
Onsite and Boundary						
Atomic City	11/10/04	-0.3 U	2.0	2.0	1.0	<MDC
CFA 2	10/5/04	0.9 U	2.8	4.3	1.2	<MDC
Highway 3	10/14/04	1.4 U	2.0	0.5 U	1.0	<MDC
Mud Lake Water Supply	11/10/04	-1.0 U	1.1	2.8	0.9	<MDC
RWMC Production	10/14/04	0.9 U	2.5	0.9 U	1.1	<MDC
Site-14	10/6/04	0.3 U	2.4	1.7	1.1	<MDC
USGS-14	10/12/04	-0.6 U	2.0	0.7 U	1.0	<MDC
USGS-104	10/6/04	-3.3 U	2.1	3.3	1.1	<MDC
USGS-112	10/25/04	-4.4 U	2.5	34.3	1.7	<MDC
USGS-115[2]	10/14/04	1.3 U	1.2	3.1	0.7	<MDC
USGS-120	10/14/04	0.1 U	2.5	3.4	1.1	<MDC
USGS-125	10/6/04	0.9 U	1.7	2.4	1.0	<MDC
Offsite and Distant						
Alpheus Spring	11/9/04	-1.4 U	2.6	4.8	1.2	<MDC
Bill Jones Hatchery	11/9/04	-0.1 U	1.9	2.1	1.0	<MDC
Clear Springs Hatchery	11/9/04	0.5 U	2.1	2.1	1.0	<MDC
Minidoka Water Supply	11/9/04	-0.5 U	1.9	2.5	1.0	<MDC
Shoshone Water Supply	11/9/04	-0.5 U	1.8	1.7	0.9	<MDC
Surface Water						
Birch Creek	10/13/04	-1.0 U	1.8	-0.6 U	0.9	<MDC

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. <MDC – Less than minimum detectable concentration for analysis by gamma spectroscopy.
[2] This sample is an average of the analytical results from two sub-samples collected at this location.

Table 12. Dissolved technetium-99 concentrations[1] in water monitoring samples, fourth quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Technetium-99	
		Concentration	± 2 SD
Onsite and Boundary			
CFA 2	10/5/04	3.1	0.2
Mud Lake Water Supply	11/10/04	0.3	0.1
USGS-104	10/6/04	0.8	0.2
USGS-112	10/25/04	17.3	0.3
USGS-115	10/14/04	1.7	0.2
USGS-120	10/14/04	1.0	0.1

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 13. Strontium-90 concentrations[1] in water monitoring samples, fourth quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Strontium-90		
		Concentration		± 2 SD
Onsite and Boundary				
CFA 2	10/5/04	0.20	U	0.32
USGS-104	10/6/04	-0.09	U	0.26
USGS-112	10/25/04	13.10		3.20
USGS-115	10/14/04	0.04	U	0.30
USGS-120	10/14/04	-0.28	U	0.25

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 14. Tritium concentrations[1] for water monitoring samples, fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Tritium		
		Concentration		± 2 SD
Onsite and Boundary				
Atomic City	11/10/04	-40	U	80
CFA 2	10/5/04	6960		220
Highway 3	10/14/04	20	U	70
Mud Lake Water Supply	11/10/04	-80	U	80
RWMC Production	10/14/04	1220		120
Site-14	10/6/04	-60	U	70
USGS-14	10/12/04	-20	U	70
USGS-104	10/6/04	1050		110
USGS-112	10/25/04	3100		160
USGS-115	10/14/04	1160		110
USGS-120	10/14/04	30	U	80
USGS-125	10/6/04	80	U	70
Offsite and Distant				
Alpheus Spring	11/9/04	0		0
Bill Jones Hatchery	11/9/04	-10	U	80
Clear Springs Hatchery	11/9/04	-60	U	70
Minidoka Water Supply	11/9/04	0	U	80
Shoshone Water Supply	11/9/04	0	U	70
Surface Water				
Birch Creek	10/13/04	100	U	70

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 15. Enriched tritium concentrations[1] for water monitoring samples, fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Tritium	
		Concentration	± 2 SD
Onsite and Boundary			
Atomic City	11/10/04	13	6
Highway 3	10/14/04	70	8
Mud Lake Water Supply	11/10/04	4 U	5
RWMC Production	10/14/04	1235	24
Site-14	10/6/04	18	6
USGS-14	10/12/04	8 U	6
USGS-120	10/14/04	158	11
USGS-125	10/6/04	68	8
Offsite and Distant			
Alpheus Spring	11/9/04	36	7
Bill Jones Hatchery	11/9/04	8 U	6
Clear Springs Hatchery	11/9/04	16	6
Minidoka Water Supply	11/9/04	8	5
Shoshone Water Supply	11/9/04	17	6
Surface Water			
Birch Creek	10/13/04	17	6

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 16. Dissolved trace metal concentrations[1] of filtered water monitoring samples, fourth quarter, 2004. Concentrations are expressed in µg/L.

Sample Location	Sample Date	Concentration				
		Barium	Chromium	Manganese	Lead	Zinc
Onsite and Boundary						
CFA 2	10/5/04	80	11	<2 U	<5 U	<5 U
Highway 3	10/21/04	52	<5 U	<2 U	<5 U	130
RWMC Production	10/21/04	39	14	<2 U	<5 U	6
Site-14	10/6/04	22	<5 U	6	<5 U	60
USGS-14	10/12/04	61	<5 U	<2 U	<5 U	<5 U
USGS-104	10/6/04	32	7	<2 U	<5 U	190
USGS-112	10/25/04	120	10	<2 U	<5 U	230
USGS-115	10/14/04	59	7	<2 U	<5 U	450
USGS-120	10/14/04	44	10	<2 U	<5 U	<5 U
USGS-125	10/6/04	34	<5 U	10	<5 U	<5 U
Surface Water						
Birch Creek	10/13/04	64	<5 U	<2 U	<5 U	<5 U

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration.

Table 17. Common ions and nutrient concentrations[1] for water monitoring samples, fourth quarter, 2004. Concentrations are expressed in mg/L.

Sample Location	Sample Date	Concentration									
		Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity[2]	Total Nitrate + Nitrite[3]	Total Phosphorus[4]
Onsite and Boundary											
CFA 2	10/5/04	80	27	25	4.0	0.3	107.0	42.5	128	2.96	0.021
Highway 3	10/21/04	48	12	6.1	2.5	0.3	6.18	19.8	148	0.401	0.02
RWMC Production	10/21/04	46	15	8.9	2.7	0.33	19.6	27.1	138	0.899	0.02
Site-14	10/6/04	42	18	17	2.8	1.07	21.5	21.8	137	1.19	0.018
USGS-14	10/12/04	36	13	15	2.8	0.61	9.56	23.2	131	0.591	0.016
USGS-104	10/6/04	40	16	8.7	2.6	0.34	13.3	19.9	124	0.827	0.019
USGS-112	10/25/04	52	14	28	3.1	0.75	42.6	28	154	2.05	0.025
USGS-115	10/14/04	42	12	16	3.6	1.07	42.7	22.9	102	1.40	0.015
USGS-120	10/14/04	37	18	24	3.6	0.94	20.4	36.9	148	0.849	0.02
USGS-125	10/6/04	41	15	12	2.9	0.35	12.3	23.7	143	0.582	0.018
Surface Water											
Birch Creek	10/13/04	47	16	5.1	1.1	1.07	6.42	24	152	0.25	0.01

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration;
[2] As $CaCo_3$
[3] Dissolved nitrate + nitrite as N
[4] Dissolved phosphorus as P

Water Verification Sampling Program

Water samples were collected from selected sites to verify results attained by various DOE monitoring programs (**Figure 3**). The primary drivers for DOE monitoring conducted at each facility are divided into three basic groups: DOE monitoring conducted to support remediation activities (CERCLA), water monitoring to support wastewater land application permits (WLAP), and monitoring conducted under DOE environmental directives (surveillance). Selected sites monitored by BBWI, NRF and ANL-W are sampled each year and a comparison of results is presented in the DEQ-INL annual report. During the fourth quarter of 2004, the DEQ-INL sampled five wastewater sites and eleven groundwater sites. Radiological results for two NRF samples collected in the third quarter of 2004 are also shown.

Gross alpha radioactivity was detected in seven of the eleven groundwater locations. All seven sites are in areas of known contamination. The levels of alpha radioactivity ranged from 2.7 ± 1.7 to 8.7 ± 4.8 pCi/L, all below the alpha radioactivity MCL of 15 pCi/L. Gross beta radioactivity was measured in all but one sample and ranged from 1.7 ± 1.0 to 187.4 ± 5.3 pCi/L. No man-made gamma-emitting radionuclides were detected this quarter. Analytical results for gross alpha, gross beta, and gamma radioactivity are presented in **Table18**.

Strontium-90 was detected in USGS-055 at a level of 55 ± 13 pCi/L, which is above the 8 pCi/L MCL. The concentration at USGS-055 is consistent with historical trends. Technetium-99 was detected at all four locations sampled, which was expected. The results are shown in **Table 19** and range from 0.5 ± 0.1 to 4.6 ± 0.2 pCi/L. The technetium-99 result for the sample from M1S may be impacted by the same uncertainties discussed previously for the technetium-99 result for Mud Lake Water Supply (**Table 20**).

Tritium was detected in eight of the eleven groundwater samples and ranged from 170 ± 80 to 18,250 ± 350 pCi/L (**Table 21**). The highest concentration was measured in the sample from TRA-7, an area of known contamination. All concentrations were below the MCL of 20,000 pCi/L. A sample from ANL-MON-A-014 was also analyzed using the electrolytic enrichment method.

Transuranic elements were not detected in the fourth quarter samples (**Tables 22, 23, and 24).** Chlorine-36 was not detected in any samples (**Table 25).** Uranium-234 and 238 were detected in the sample from USGS-123, an area of known contamination, which is down gradient from the INTEC tank farms (**Table 26**).

Common ion results are within expected ranges and are shown in **Table 27**. Alkalinity ranged from 95 to 280 mg/L. Chloride ranged from 4 to 240 mg/L. Fluoride results ranged from 0.14 to 0.98 mg/L. Silica results ranged from 20 to 34.9 mg/L. Sulfate ranged from 14.2 to 151 mg/L. TDS ranged from 170 to 690, the highest concentrations are found in wastewater samples. Detectable TSS ranged from 1.6 to 310, the highest result found in the influent to the INTEC Sewage Treatment Plant (STP).

All measured nutrient concentrations at each monitoring site were within expected ranges **(Table 28)**. Detectable results for nitrate + nitrite as nitrogen ranged from 0.05 to 2.79 mg/L. Total phosphorous ranged from 0.02 to 4.97 mg/L. Detectable TKN results ranged from 0.07 to 43.2 mg/L. There were no detectable results for ammonia and nitrite analyses.

Results for metal analysis are shown in **Table 29**. All metals results were consistent with historical trends, except for the iron level in TRA-08 and the manganese level in well TAN-10A, which were both higher than previous results.

The analytical results for detectable VOCs are shown in **Table 30**. The sample for M3S contained detected levels of carbon tetrachloride and trichloroethylene which is consistent with historical trends. MDC's for all samples monitored for VOCs during the fourth quarter of 2004 are listed in Appendix D.

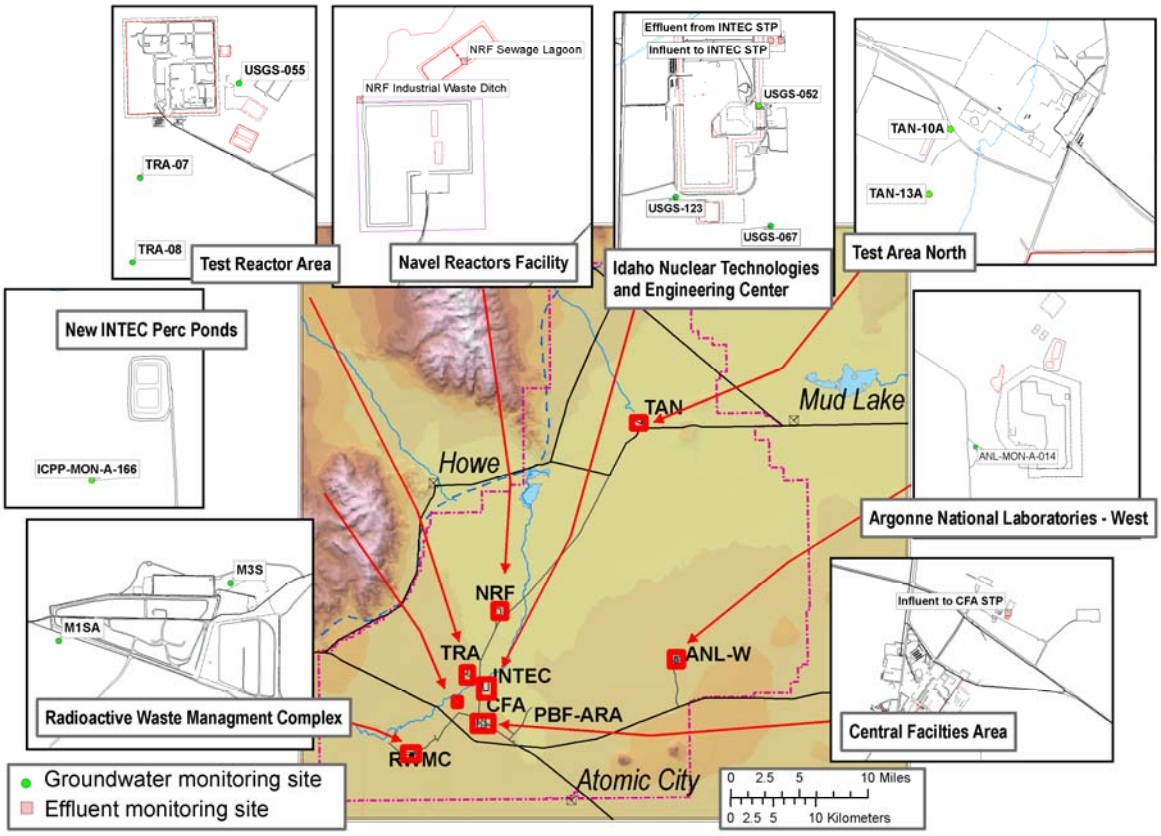

Figure 3. Planned water verification sampling sites for 2004. The purpose of DOE monitoring for each site is indicated in the figure key.

Table 18. Gross alpha, gross beta, and cesium-137 concentrations[1] in unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Gross Alpha		Gross Beta		Man-made, gamma-emitting radionuclide Cesium-137	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Wastewater							
NRF Ind. Waste Ditch	9/27/04	-13.4 U	12.9	-4.3 U	5.0	0.3 Y	1.4
NRF Sewage Lagoon	9/27/04	3.0 U	7.3	17.4	3.1	-0.1 U	1.5
Effluent from INTEC STP	12/7/04	-1.6 U	4.8	8.9	2.5	0.0 U	1.7
Groundwater							
ANL-MON-A-014	10/25/04	-0.3 U	1.8	2.6	1.0	1.1 U	1.4
ICPP-MON-A-166[2]	10/27/04	0.8 U	1.2	2.9	0.7	0.5 U	1.0
M1S	12/1/04	2.7	1.7	3.3	1.0	-0.3 U	1.6
M3S	12/1/04	-0.9 U	2.0	1.7	1.0	-0.2 U	1.7
TAN-10A	10/12/04	8.7	4.8	187.4	5.3	-0.2 U	1.9
TAN-13A	10/12/04	3.1	1.8	3.7	1.0	0.5 U	1.4
TRA-07	10/27/04	5.4	2.6	5.0	1.1	-0.3 U	1.4
TRA-08	10/27/04	4.7	2.2	4.3	1.1	0.3 U	1.5
USGS-052	10/13/04	5.4	2.2	131.0	2.7	0.5 U	1.5
USGS-055	10/27/04	5.9	3.0	131.2	2.9	0.3 U	1.3
USGS-123	10/25/04	1.7 U	2.5	6.1	1.1	-0.6 U	1.6

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.
[2] This sample is an average of the analytical results from two sub-samples collected at this location.

Table 19. Strontium-90 concentrations[1] in unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Strontium-90		
		Concentration		± 2 SD
Wastewater				
NRF Ind. Waste Ditch	9/27/04	-0.03	U	0.27
NRF Sewage Lagoon	9/27/04	-0.06	U	0.28
Groundwater				
M1S	12/1/04	-0.01	U	0.22
M3S	12/1/04	0.01	U	0.24
TRA-07	10/27/04	-0.13	U	0.26
TRA-08	10/27/04	0.04	U	0.28
USGS-055	10/27/04	55.0		13.0
USGS-123	10/25/04	0.37	U	0.31

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 20. Dissolved technetium-99 concentrations[1] in unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Technetium-99	
		Concentration	± 2 SD
Groundwater			
M1S	12/1/04	0.5	0.1
M3S	12/1/04	0.9	0.1
USGS-055	10/27/04	0.8	0.1
USGS-123	10/25/04	4.6	0.2

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 21. Tritium concentrations[1] in unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location	Sample Date	Tritium		
		Concentration		± 2 SD
Wastewater				
NRF Ind. Waste Ditch	9/27/04	20	U	70
NRF Sewage Lagoon	9/27/04	50	U	70
Groundwater				
ANL-MON-A-014	10/25/04	50	U	80
ANL-MON-A-014[2]	10/25/04	18		7
ICPP-MON-A-166	10/27/04	170		80
M1S	12/1/04	-10	U	80
M3S	12/1/04	1150		110
TAN-10A	10/12/04	230		90
TAN-13A	10/12/04	-90	U	70
TRA-07	10/27/04	18250		350
TRA-08	10/27/04	3390		160
USGS-052	10/13/04	2510		150
USGS-055	10/27/04	6440		220
USGS-123	10/25/04	4980		200

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.
[2] Sample was analyzed by electrolytic enrichment procedure for tritium.

Table 22. Americium-241 concentrations[1] in water verification samples, fourtht quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Americium-241		
		Concentration		±2SD
Groundwater				
M1S	12/1/04	0	U	0.039
M3S	12/1/04	0.01	U	0.035
USGS-123	10/25/04	0.002	U	0.027

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 23. Neptunium-237 concentrations[1] in water verification samples, fourth quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Neptunium-237	
		Concentration	±2SD
Groundwater			
USGS-123	10/25/04	0 U	0.062

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 24. Total plutonium-238, plutonium-239/240, and plutonium-241 concentrations[1] in water verification samples, fourth quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Plutonium-238		Plutonium-239/240		Plutonium-241	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
USGS-123	10/25/04	-0.002 U	0.032	0.007 U	0	-1.5 U	3.0
M1S	12/1/04	0.018 U	0.033	0.004 U	0	1.4 U	3.1
M3S	12/1/04	-0.002 U	0.025	-0.004 U	0	1.5 U	3.1

[1] Data qualifiers: U non-detection, J = estimate, R = rejected.

Table 25. Chlorine-36 concentrations[1] in water verification samples, fourth quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Chlorine-36	
		Concentration	±2SD
Groundwater			
M1S	12/1/04	0.857 U	1.24
M3S	12/1/04	-1.8 U	1.3

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected.

Table 26. Uranium-234, uranium-235, and uranium-238 concentrations[1] in water verification samples, fourth quarter, 2004. Concentrations are expressed in pCi/L. Samples were not filtered.

Sample Location	Sample Date	Uranium-234		Uranium-235		Uranium-238	
		Concentration	± 2 SD	Concentration	± 2 SD	Concentration	± 2 SD
Groundwater							
USGS-123	10/25/04	3.13	0.77	0.07 U	0.1	1.28	0.43

[1] Data qualifiers: U non-detection, J = estimate, R = rejected.

Table 27. Common ion concentrations[1] of unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in mg/L.

Sample Location	Sample Date	Concentration						
		Total Alkalinity	Chloride	Fluoride	Silica	Sulfate	TDS[2]	TSS[3]
Wastewater								
Effluent from INTEC STP)	12/7/04	260	156.0	0.25	28.7	37.5	580	21.0
Influent to CFA STP	12/21/04	208	240.0	0.95	26.7	53.0	690	18.0
Influent to INTEC STP	12/7/04	280	151.0	0.30	23.4	26.9	540	310.0
Groundwater								
ANL-MON-A-014	10/25/04	136	19.1	0.80	33.3	16.5	240	<1.0 U
ICPP-MON-A-166	10/27/04	125	8.4	0.98	26.9	18.8	210	<1.0 U
M1S	12/1/04	95	13.8	0.44	34.9	20.5	170	<1.0 U
M3S	12/1/04	139	13.7	0.35	26.1	25.1	220	<1.0 U
TAN-10A	10/12/04	255	101.0	0.14	20.0	40.2	510	1.6
TAN-13A	10/12/04	135	4.0	0.95	23.6	14.2	190	<1.0 U
TRA-07	10/27/04	135	20.9	0.67	22.9	151.0	440	15.0
TRA-08	10/27/04	157	13.1	0.87	20.9	49.9	280	14.0
USGS-052	10/13/04	149	27.1	0.94	23.5	26.6	270	<1.0 U
USGS-055	10/27/04	169	14.1	0.69	25.5	67.8	330	25.0
USGS-123	10/25/04	165	28.8	0.69	27.9	25.2	320	6.8

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration.
[2] Total dissolved solids.
[3] Total suspended solids.

Table 28. Total nutrient concentrations[1] of unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in mg/L.

Sample Location	Sample Date	Concentration				
		Nitrite + Nitrate (as Nitrogen)	Phosphorus	Total Kjeldahl Nitrogen	Ammonia	Nitrite as Nitrogen
Wastewater						
Effluent from INTEC STP	12/7/04	1.03	3.19	19.4	NR	NR
Influent to CFA STP	12/21/04	0.621	3.24	21.6	NR	NR
Influent to INTEC STP	12/7/04	0.045	4.97	43.2	NR	NR
Groundwater						
ANL-MON-A-014	10/25/04	1.95	0.017	NR	NR	NR
ICPP-MON-A-166	10/27/04	0.356	0.019	<0.05 U	NR	<0.005 U
M1S	12/1/04	1.04	0.021	NR	NR	NR
M3S	12/1/04	0.847	0.02	NR	NR	NR
TAN-10A	10/12/04	<0.005 U	0.086	0.072	<0.005 U	<0.005 U
TAN-13A	10/12/04	0.427	0.024	<0.05 U	<0.005 U	<0.005 U
TRA-07	10/27/04	1.27	0.04	NR	NR	NR
TRA-08	10/27/04	0.948	0.021	NR	NR	NR
USGS-052	10/13/04	2.79	0.026	<0.05 U	<0.005 U	<0.005 U
USGS-055	10/27/04	1.19	0.417	NR	NR	NR
USGS-123	10/25/04	0.878	0.991	NR	NR	NR

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.

Table 29. Metal concentrations[1] of water samples collected for verification purposes during the fourth quarter, 2004. Unfiltered samples are identified as (total), filtered samples are identified as (dissolved).

Sample Location	Sample Date	Concentration											
		Calcium (mg/L)	Magnesium (mg/L)	Sodium (mg/L)	Potassium (mg/L)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)	Cobalt (µg/L)	Copper (µg/L)	Iron (µg/L)
Wastewater													
Effluent from INTEC STP (total)	12/7/04	66	21	105.0	16	<5 U	90	<1 U	<1 U	<5 U	<10 U	<10 U	80
Influent to CFA STP (total)	12/21/04	83	28	112.0	9.8	NR	NR	NR	NR	NR	NR	NR	400
Influent to INTEC STP (total	12/7/04	51	16	101.0	15	NR	NR	NR	NR	NR	NR	NR	300
Groundwater													
ANL-MON-A-014 (total)	10/25/04	41	13	18	3.3	<5 U	39	<1 U	<1 U	<5 U	<10 U	<10 U	<10 U
ICPP-MON-A-166 (dissolved)	10/27/04	34	12	9.6	2.6	<5 U	47	<1 U	<1 U	7	<10 U	<10 U	<10 U
ICPP-MON-A-166 (total)	10/27/04	36	12	9.7	2.7	<5 U	49	<1 U	<1 U	7	<10 U	<10 U	70
M1S (dissolved)	12/1/04	27	12	11	2.6	<5 U	21	<1 U	<1 U	33	<10 U	<10 U	10
M1S (total)	12/1/04	28	13	11	2.6	<5 U	22	<1 U	<1 U	36	<10 U	<10 U	60
M3S (dissolved)	12/1/04	45	16	8.4	2.7	<5 U	42	<1 U	<1 U	13	<10 U	<10 U	<10 U
M3S (total)	12/1/04	46	16	8.4	2.7	<5 U	43	<1 U	<1 U	15	<10 U	<10 U	20
TAN-10A (total)	10/12/04	95	23	51	3.9	<5 U	260	<1 U	<1 U	<5 U	<10 U	<10 U	860
TAN-13A (total)	10/12/04	42	11	5.8	2.3	<5 U	70	<1 U	<1 U	<5 U	<10 U	<10 U	80
TRA-07 (dissolved)	10/27/04	87	20	16	3.3	<5 U	90	<1 U	<1 U	100	<10 U	<10 U	<10 U
TRA-07 (total)	10/27/04	89	21	16	3.3	<5 U	100	<1 U	<1 U	110	<10 U	10	560
TRA-08 (dissolved)	10/27/04	55	17	12	3.7	<5 U	80	<1 U	<1 U	30	<10 U	<10 U	30
TRA-08 (total)	10/27/04	56	17	12	3.6	<5 U	80	<1 U	<1 U	30	<10 U	<10 U	2900
USGS-052 (total)	10/13/04	57	16	14	3	<5 U	91	<1 U	<1 U	5	<10 U	<10 U	<10 U
USGS-055 (dissolved)	10/27/04	67	18	15	3	8	59	<1 U	<1 U	20	<10 U	<10 U	<10 U
USGS-055 (total)	10/27/04	68	18	15	3	8	78	<1 U	<1 U	20	<10 U	10	550
USGS-123 (total)	10/25/04	41	15	44	3.1	<5 U	67	<1 U	<1 U	7	<10 U	10	260

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.

Table 29 continued. Metal concentrations[1] of water samples collected for verification purposes during the fourth quarter, 2004. Unfiltered samples are identified as (total), filtered samples are identified as (dissolved).

Sample Location	Sample Date	Concentration										
		Lead (µg/L)	Manganese (µg/L)	Thallium (µg/L)	Nickel (µg/L)	Silver (µg/L)	Vanadium (µg/L)	Zinc (µg/L)	Antimony (µg/L)	Aluminum (µg/L)	Selenium (µg/L)	Mercury (µg/L)
Wastewater												
Effluent from INTEC STP (total)	12/7/04	<5 U	17	<1.5 U	<10 U	<1 U	NR	12	<5 U	<100 U	<10 U	<0.5 U
Influent to CFA STP (total)	12/21/04	NR	NR	NR	NR	NR	NR	NR	NR	200	NR	NR
Influent to INTEC STP (total)	12/7/04	NR	NR	NR	NR	NR	NR	NR	NR	200	NR	NR
Groundwater												
ANL-MON-A-014 (total)	10/25/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	<5 U	<5 U	<100 U	<10 U	<0.5 U
ICPP-MON-A-166 (dissolved)	10/27/04	<5 U	30	<1.5 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
ICPP-MON-A-166 (total)	10/27/04	<5 U	40	<1.5 U	<10 U	<1 U	NR	11	<5 U	110	<10 U	<0.5 U
M1S (dissolved)	12/1/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	<5 U	<5 U	<100 U	<10 U	<0.5 U
M1S (total)	12/1/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	19	<5 U	<100 U	<10 U	<0.5 U
M3S (dissolved)	12/1/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	<5 U	<5 U	<100 U	<10 U	<0.5 U
M3S (total)	12/1/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	<100 U	12	<5 U	<100 U	<10 U	<0.5 U
TAN-10A (total)	10/12/04	<5 U	400	<1.5 U	<10 U	<1 U	NR	13	<5 U	<100 U	<10 U	<0.5 U
TAN-13A (total)	10/12/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	NR	150	<5 U	<100 U	<10 U	<0.5 U
TRA-07 (dissolved)	10/27/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	NR	6	<5 U	<100 U	<10 U	<0.5 U
TRA-07 (total)	10/27/04	<5 U	8	<1.5 U	<10 U	<1 U	NR	290	<5 U	610	<10 U	<0.5 U
TRA-08 (dissolved)	10/27/04	<5 U	2	<1.5 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
TRA-08 (total)	10/27/04	<5 U	20	<1.5 U	<10 U	<1 U	NR	16	<5 U	250	<10 U	<0.5 U
USGS-052 (total)	10/13/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
USGS-055 (dissolved)	10/27/04	<5 U	<2 U	<1.5 U	<10 U	<1 U	NR	<5 U	<5 U	<100 U	<10 U	<0.5 U
USGS-055 (total)	10/27/04	<5 U	10	<1.5 U	<10 U	<1 U	NR	11	<5 U	780	<10 U	<0.5 U
USGS-123 (total)	10/25/04	<5 U	16	<1.5 U	<10 U	<1 U	NR	8	<5 U	370	<10 U	<0.5 U

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. A "<" indicates a result below the Minimum Detectable Concentration; NR = analysis not requested.

Table 30. Volatile organic compound (VOC) concentrations[1] of unfiltered water samples collected for verification purposes during the fourth quarter, 2004. Concentrations are expressed in µg/L.

Sample Site/Analyte	MDL	Result
M3S		
Carbon Tetrachloride	0.39	3.90
Trichloroethylene	0.07	0.84

[1] Data qualifiers: U = non-detection, J = estimate, R = rejected. MDC – Minimum Detectable Concentration.

Terrestrial Monitoring Results

The ESP conducts terrestrial (soil and milk) monitoring and verification to provide an indication as to the long-term deposition and migration of contaminants in the environment, and to provide independent verification of DOE's analytical measurement of terrestrial variables.

Results for analyses of milk samples, which are collected monthly, are presented in **Table 31**. Naturally occurring potassium-40 was detected in all samples within the expected range. Iodine-131, a man-made radionuclide, was not detected.

DEQ-INL monitors long-term radiological conditions using measurement devices capable of identifying and measuring quantities of gamma-emitting radionuclides in soil. Monitoring concentrations of gamma-emitting radionuclides in surface soil provides insight to the transport, deposition, and accumulation of radioactive material in the environment as a result of INEEL operations and the historic atmospheric testing of nuclear weapons. *In-situ* gamma spectroscopic measurements were conducted at 13 locations onsite during the fourth quarter of 2004. Gamma spectroscopic analysis results are shown in **Table 32**.

Table 31. Gamma spectroscopy analysis data for milk samples, fourth quarter, 2004. Concentrations are expressed in pCi/L.

Sample Location/Dairy	Sample Date	Naturally occurring gamma-emitting radionuclide Potassium-40 (pCi/L)		Man-made gamma-emitting radionuclide Iodine-131[1]
		Concentration	± 2 SD	
Monitoring Samples				
Howe/Nelson-Ricks Creamery	10/12/04	1376	113	<MDC
	11/08/04	1372	108	<MDC
	12/07/04	1641	114	<MDC
Mud Lake/Nelson-Ricks Creamery	10/12/04	1678	113	<MDC
	11/08/04	1498	120	<MDC
	12/07/04	1630	114	<MDC
Rupert-Minidoka/Kraft	10/12/04	1779	117	<MDC
	11/09/04	1657	115	<MDC
	12/07/04	1469	114	<MDC
Gooding/Glanbia	10/12/04	1416	109	<MDC
	11/09/04	1520	121	<MDC
	12/07/04	1387	116	<MDC
Verification Samples[2]				
Roberts	10/05/04	1384	114	<MDC
Rupert	10/05/04	1483	113	<MDC
Blackfoot	11/02/04	1584	112	<MDC
Terreton	11/02/04	1453	112	<MDC
Dietrich	12/07/04	1480	115	<MDC
Idaho Falls	12/07/04	1441	118	<MDC

[1] <MDC – Less than Minimum Detectable Concentration (approximately 4 pCi/L for Iodine-131).
[2] DEQ-INL samples collected by the offsite INEEL environmental surveillance contractor.

Table 32. Gamma spectroscopic analysis results for soil monitoring conducted during the fourth quarter of 2004. *In-Situ* gamma spectroscopy conducted by DEQ-INL. Spectroscopy assumed radioisotopes to be homogeneously distributed in soil for a depth of 5-cm and a soil density of 1.5 g/mL. Concentrations are reported in pCi/g.

Location	Sample Type	Sample Depth (cm)	Sample Date	Cesium-137			Potassium-40		
				Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
Van Buren	*in situ*	0 - 5	11/2/04	0.53	0.03	0.04	18	0.36	0.6
TRA A1.3	*in situ*	0 - 5	11/2/04	0.77	0.03	0.05	16	0.32	0.5
TRA A2.3	*in situ*	0 - 5	11/2/04	0.45	0.02	0.04	17	0.34	0.6
TRA A2.4	*in situ*	0 - 5	11/2/04	0.47	0.02	0.04	17	0.33	0.6
TRA A3.5	*in situ*	0 - 5	11/2/04	0.46	0.02	0.04	17	0.34	0.6
TRA A4.5	*in situ*	0 - 5	11/2/04	0.48	0.02	0.04	16	0.32	0.5
TRA A5.5	*in situ*	0 - 5	11/2/04	0.38	0.02	0.04	16	0.33	0.5
PBF-1	*in situ*	0 - 5	11/3/04	0.33	0.03	0.04	17	0.40	0.7
PBF-2	*in situ*	0 - 5	11/3/04	0.41	0.03	0.05	15	0.40	0.6
PBF-3	*in situ*	0 - 5	11/3/04	0.40	0.03	0.05	17	0.42	0.7
PBF-4	*in situ*	0 - 5	11/3/04	0.42	0.03	0.05	18	0.43	0.7
PBF-5	*in situ*	0 - 5	11/3/04	0.45	0.03	0.05	18	0.44	0.7
PBF-11	*in situ*	0 - 5	11/3/04	0.42	0.03	0.05	19	0.42	0.7

Quality Assurance

The measurement of any physical quantity is subject to uncertainty from errors that may be introduced during sample collection, measurement, calibration, and the reading and reporting of results. While the sum of these inaccuracies cannot be quantified for each analytical result, a quality assurance program can evaluate the overall quality of a data set and possibly identify and address errors or inaccuracies.

This section summarizes the results of the quality assurance (QA) assessment of the data collected for the fourth quarter of 2004 for the DEQ-INL's ESP. It also summarizes the quality control (QC) samples (spikes, blanks, and duplicates) submitted to the Idaho Bureau of Laboratories-Boise (IBL) for nonradiological analyses and to Idaho State University's Environmental Monitoring Laboratory (ISU-EML) for radiological analyses during the quarter. All analyses and QC measures at the analytical laboratories used by the ESP are performed in accordance with approved written procedures maintained by each respective analytical laboratory. Sample collection is performed in accordance with written procedures maintained by the DEQ-INL.

Analytical results for blanks, duplicates, and spikes are used to assess the precision, accuracy, and representativeness of results from analyzing laboratories. During the fourth quarter of 2004, the DEQ-INL submitted 94 QC samples for various radiological and nonradiological analyses (**Table 33**).

Blank Samples

Blank samples consist of matrices that have negligible, acceptably low, or unmeasurable amounts of the analyte(s) of interest in them. They are designed to determine if analyses will provide a "zero" result

when no contaminant is expected to be present or an acceptable measure of "background," and therefore monitor any bias that may have been introduced during sample collection, storage, shipment, and analysis. Blank sample results submitted for gross alpha and gross beta screening in air for the fourth quarter of 2004 are presented in **Table 34** . Blank sample results for select gamma emitters in air from composited air filters are presented in **Table 35 .** Data for blank analyses used to assess data quality for tritium in water vapor in air are presented in **Table 36** . Blank analysis results for technetium-99 and strontium-90 are presented in **Table 37**. Blank analysis results for metals, common ion, and nutrients in ground and surface water for the fourth quarter of 2004 are found in **Tables 38 and 39** . Blank analyses results for cesium-137, potassium-40, tritium, enriched tritium, gross alpha, and gross beta in ground and surface water media are presented in **Table 40.**

No anomalies were observed from the assessment of field blank samples as measured by the analytical laboratories used by DEQ-INL for the fourth quarter of 2004.

Duplicate Samples

Duplicate samples are collected in a manner such that the samples are thought to be essentially identical in composition and are used to assess analytical precision. The difference between the original sample and the duplicate sample is expressed as a relative percent difference (RPD) and is used to measure a laboratory's ability to reproduce consistent results. For radiological analyses, the standard deviation of the differences can be used as an indicator of the overall precision of the data set. Duplicate results for ground and surface water are presented in **Table 41** for radiological analyses. Duplicate results for metals, common ion and nutrients, and VOCs in ground and surface water are presented in **Tables 42 ,43,** and **44** respectively.

No anomalies were observed from the assessment of field duplicate samples as measured by the analytical laboratories used by DEQ-INL for the fourth quarter of 2004.

Spiked Samples

Spiked samples are samples to which known concentrations of specific analytes have been added in order to assess the bias a laboratory may have in accurately measuring these analytes. To determine agreement after laboratory analysis, DEQ-INL calculates the difference between the known concentration in the sample and the measured concentration by the laboratory. This result is known as percent recovery (%R) and the acceptable range used by DEQ-INL is 100 ± 25 percent. During fourth quarter 2004, no field matrices were spiked to assess the influence of the sample media on laboratory performance. However, spiked de-ionized water samples were submitted for nonradiological groundwater constituents and the results are summarized in **Tables 45 and 46** for the fourth quarter of 2004.

DEQ-INL also prepares additional "spike-like" quality control samples to assess ambient radiation measurement bias. Once per quarter, DEQ-INL irradiates a number of electret ionization chambers (EIC) to verify EIC response. Irradiations of EICs are conducted in a repeatable geometry to a known exposure of 30 mR and a "blind" exposure ranging from 20 to 50 mR. EIC responses are compared directly with the exposure received from the NIST traceable cesium-137 source provided by ISU-EML. EIC response is considered acceptable if each measurement agrees within 25 percent of the known irradiated quantity. The irradiation results for fourth quarter 2004 are presented in **Table 47.**

No anomalies were observed from the assessment of spiked samples as measured by DEQ-INL or the analytical laboratories used by DEQ-INL for the fourth quarter of 2004.

Analytical QA/QC Assessment

No issues involving sample chain of custody, sample holding times, the analysis of blank, duplicate, and spiked samples were observed during the fourth quarter of 2004 which significantly affected data quality. Methodologies and data reports issued by the contracting laboratories generally conformed to the requirements of DEQ-INL. Minor transcription errors in the DEQ-INL database were noted for fourth quarter 2004 data.

Data usability is the measure of data that is not rejected compared to the amount that was expected to be obtained. The overall data usability rate for the fourth quarter of 2004 met the criteria of the DEQ-INL ESP and is summarized is **Table 33.**

Preventative Maintenance and Equipment Reliability

All equipment was calibrated and checked according to pre-described periodicity. Service reliability for air sampling equipment for the fourth quarter of 2004 is summarized in **Table 48**. Air sampling equipment requiring repair included:

- The low-volume air sampler (radioiodine sampler pump) at the Monteview monitoring station (pump replaced - repair completed).
- The tritium sampler pump at the Idaho Falls monitoring station (not repaired - low-volume air sampler at this location is being used to sample both radioiodine and tritium).

Conclusion

All data collected for the fourth quarter of 2004 have been assigned the applicable qualifiers to designate the appropriate use of the data. In addition, all data has been verified and deemed complete, meeting the requirements and data quality objectives established by DEQ-INL.

Table 33. Summary of the analytical performance and usability of the analyses performed for the DEQ-INL ESP for fourth quarter, 2004.

Media Sampled	Collection Device	Analyte	Test Analyses	Blank Analyses	Duplicate Analyses	Spike Analyses	Data Rejected[1]	Analyzing Lab[2]
AIR								
Particulate (Does not include PM_{10} measurements)	4 inch filter	Gross alpha	142	13	0	0	0	ISU-EML
		Gross beta	142	13	0	0	0	ISU-EML
		Gamma emitters	11	1	0	0	0	ISU-EML
		Radiochemical	0	0	0	0	0	ISU Sub
Particulate	Desiccant column	Tritium	29	5	0	0	0	ISU-EML
Gaseous	Charcoal filter	Iodine-131	13	0	0	0	0	ISU-EML
Precipitation	Poly bottle	Tritium	8	0	0	0	0	ISU-EML
		Gamma emitters	8	0	0	0	0	ISU-EML
WATER								
Groundwater & Surface Water	Grab or composite	Gross alpha	32	2	3	0	0	ISU-EML
		Gross beta	32	2	3	0	0	ISU-EML
		Gamma emitters	32	2	3	0	0	ISU-EML
		Tritium	31	2	3	0	0	ISU-EML
		Enriched tritium	17	2	1	0	0	ISU-EML
		Technetium-99	10	1	2	0	0	ISU-EML
		Radiochemical	16	1	3	0	0	ISU Sub
		Metals	31	2	3	2	0	IBL
		Common Ions	25	2	2	2	0	IBL
		Nutrients	25	2	2	2	0	IBL
		Volatile Organics	3	0	1	0	0	IBL Sub
TERRESTRIAL								
Milk	Grab or composite	Gamma emitters	18	0	0	0	0	ISU-EML
Soil	*in situ*	Gamma emitters	13	0	0	0	0	DEQ-INL
	Grab – "puck"	Gamma emitters	0	0	0	0	0	ISU-EML
RADIATION								
Ambient Air	EICs	Gamma Radiation	93	4	0	8	0	DEQ-INL
	HPICs	Gamma Radiation	NA	NA	NA	NA	NA	DEQ-INL
Total Analyses			731	54	26	14	0	
Total of QC Analyses (blanks, duplicates, and spikes)						94		
Percentage of QC analyses of total analyses[3]						12.9		
Percentage of usable data[4]						100		

[1] Combined Laboratory and DEQ-INL rejection criteria (data was rejected for any reason).
[2] ISU-EML = Idaho State University – Environmental Monitoring Laboratory; ISU Sub = Subcontract laboratory to ISU-EML; IBL = Idaho Bureau of Laboratories, Boise; IBL Sub = Subcontract laboratory to IBL; DEQ-INL = Analyzed by INEEL Oversight and Radiation Control, Idaho Department of Environmental Quality.
[3] Analyzing quality control samples at a rate of approximately 5 to 10 percent of the total number of analyses performed for the year is deemed appropriate for the DEQ-INL ESP.
[4] Data usability rate [total analyses – rejected data]/[total analyses] of 90 percent or higher is acceptable for the DEQ-INL ESP.

Table 34. Blank analysis results for gross alpha and beta in particulate air (TSP) for the fourth quarter, 2004. Concentrations[1] and associated uncertainties (2 SD) are expressed in 1 x 10^{-3} pCi/m^3.

Collection Period		Corrected volume (m^3) [1]	Gross alpha		Gross beta	
Start	Stop		Value	Uncertainty (± 2 SD)	Value	Uncertainty (± 2 SD)
09/30/04	10/07/04	1747	-0.2	0.1	0.1	0.2
10/07/04	10/14/04	1747	-0.1	0.1	0.0	0.2
10/14/04	10/21/04	1747	0.0	0.1	0.2	0.2
10/21/04	10/28/04	1747	0.0	0.1	-0.1	0.2
10/28/04	11/04/04	1747	0.1	0.2	0.1	0.3
11/04/04	11/11/04	1747	0.1	0.1	0.2	0.2
11/11/04	11/18/04	1747	0.0	0.1	0.0	0.2
11/18/04	11/24/04	1747	0.0	0.1	0.1	0.2
11/24/04	12/02/04	1747	0.1	0.1	0.1	0.2
12/02/04	12/09/04	1747	0.0	0.1	-0.1	0.2
12/09/04	12/16/04	1747	-0.2	0.1	0.1	0.2
12/16/04	12/23/04	1747	0.0	0.1	-0.2	0.2
12/23/04	12/30/04	1747	-0.2	0.2	0.1	0.2

[1] A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters.

Table 35. Blank analysis results for gamma spectroscopy for TSP particulate air filters for the fourth quarter, 2004. Concentrations[1] are expressed in 1 x 10^{-5} pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Analysis Date	Beryllium-7			Ruthenium-106/ Rhodium-106			Antimony-125		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
01/19/05	-15	48	81	-12	38	66	1	10	16

[1] These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.

Table 35 continued. Blank analysis results for gamma spectroscopy for TSP particulate air filters for the fourth quarter, 2004. Concentrations[1] are expressed in 1x10^{-5} pCi/m^3 with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Analysis Date	Cesium-134			Cesium-137		
	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
01/19/05	2	5	8	2	4	7

[1] These concentrations are from blank filters collected weekly, composited, and analyzed for the calendar quarter. A volume equal to the average of the volumes collected through each valid field filter was used to compute "concentrations" for the blank for meaningful comparison to sample results. No air was passed through the blank filters. NR = analysis not requested.

Table 36. Blank analysis results for tritium water vapor from air samples for the fourth quarter, 2004 . Concentrations are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Sample Number	Start Date	Collect Date	Analysis Date	Tritium		
				Concentration	± 2 SD	MDC
OP044ZTR01	11/30/04	11/30/04	12/08/04	0.06	0.07	0.12
OP044ZTR02	11/30/04	11/30/04	12/08/04	0.03	0.07	0.12
OP044ZTR03	01/14/05	01/14/05	01/20/05	0.02	0.08	0.13
OP044ZTR04	01/14/05	01/14/05	01/20/05	-0.04	0.07	0.12
OP044ZTR05	11/02/04	01/14/05	01/20/05	0.02	0.07	0.12

Table37. Blank analysis results for technetium-99 and strontium-99 in ground and surface water samples for the fourth quarter, 2004. Concentrations[1] are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Sample Number	Technetium-99			Strontium-90		
	Concentration	±2 SD	MDC	Concentration	±2 SD	MDC
044W023	NR[1]	-	-	0.16	0.29	0.66
044W022	0.1	0.2	0.3	NR[1]	-	-

[1] NR = analysis not requested.

Table 38. Blank analysis results (in :g/L) for metals in ground and surface water for the fourth quarter, 2004.

Sample Number	Sample Date	Barium	Chromium	Manganese	Lead	Zinc
044W106	10/6/2005	<2	<5	<2	<5	<5
044W111	10/25/2005	<2	<5	<2	<5	<5

Table 39. Blank analysis results (in mg/L) for common ion and nutrients in ground and surface water for the fourth quarter, 2004.

Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity as CaCO3	Total Nitrogen	Total Phosphorus
044W105, 106, and 107	10/6/2005	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<2	<1	<0.005	<0.005
044W110, 111, and 112	10/25/2005	<0.1	<0.1	<0.1	<0.1	<0.1	<2	<2	<1	<0.005	<0.005

Table 40. Blank analysis results for cesium-137, potassium-40, tritium, enriched tritium, gross alpha, and gross beta in ground and surface water samples for the fourth quarter, 2004. Concentrations are expressed in pCi/L with associated uncertainty (± 2 SD) and minimum detectable concentration (MDC).

Sample Number	Cesium-137			Potassium-40			Tritium			Enriched Tritium			Gross Alpha			Gross Beta		
	Concentration	±2 SD	MDC	Concentration	±2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC	Concentration	± 2 SD	MDC
044W103	-0.5	1.6	2.8	-50	48	81	NR[1]	-	-	NR[1]	-	-	-0.4	0.5	0.9	-1.1	0.8	1.3
044W108	0.5	2.2	2.9	-36	49	83	NR[1]	-	-	NR[1]	-	-	-0.6	0.5	1.0	-0.8	0.8	1.3
044W104	NR[1]	-	-	NR[1]	-	-	60	70	120	35	7	10	NR[1]	-	-	NR[1]	-	-
044W109	NR[1]	-	-	NR[1]	-	-	80	80	130	36	8	11	NR[1]	-	-	NR[1]	-	-

[1] NR = analysis not requested.

Table 41. Duplicate radiological analysis results (in pCi/L) for ground and surface water, fourth quarter, 2004.

Analysis/ Sample Location	Original Sample Number	Analysis Date	Concentration	± 2 SD	Duplicate Sample Number	Analysis Date	Concentration	± 2 SD	$/R_1-R_2/$	$3(s_1^2+s_2^2)^{1/2}$	Within Criteria?[1]
Gross Alpha											
CFA 2	044W032	12/10/2004	0.9	2.8	044W082	1/7/2005	0.0	2.3	0.9	10.9	Yes
Mud Lake Water Supply	044W011	12/8/2004	-1.0	1.1	044W015	12/10/2004	-1.5	1.2	0.5	4.9	Yes
M3S	04VG238	1/24/2005	-0.9	2.0	04VG249	2/1/2005	-1.9	1.9	1.0	8.3	Yes
Gross Beta											
CFA 2	044W032	12/10/2004	4.3	1.2	044W082	1/7/2005	4.4	1.1	0.1	4.9	Yes
Mud Lake Water Supply	044W011	12/8/2004	2.8	0.9	044W015	12/10/2004	3.0	1.0	0.2	4.0	Yes
M3S	04VG238	1/24/2005	1.7	1.0	04VG249	2/1/2005	1.8	0.9	0.1	4.0	Yes
Gamma Spectroscopy Cesium-137											
CFA 2	044W032	11/24/2004	-0.8	2.4	044W082	12/3/2004	-0.6	1.4	0.2	8.3	Yes
Mud Lake Water Supply	044W011	11/23/2004	-0.2	1.4	044W015	11/23/2004	0.0	1.4	0.2	5.9	Yes
M3S	04VG238	12/21/2004	-0.2	1.7	04VG249	1/3/2005	-0.5	1.4	0.3	6.6	Yes
Gamma Spectroscopy Potassium-40											
CFA 2	044W032	11/24/2004	-57.0	48.0	044W082	12/3/2004	16.0	55.0	73.0	219.0	Yes
Mud Lake Water Supply	044W011	11/23/2004	17.0	45.0	044W015	11/23/2004	-9.0	49.0	26.0	199.6	Yes
M3S	04VG238	12/21/2004	54.0	58.0	04VG249	1/3/2005	11.0	42.0	43.0	214.8	Yes
Tritium											
CFA 2	044W033	12/10/2004	6.96	0.22	044W083	1/14/2005	6.89	0.22	0.07	0.9	Yes
Mud Lake Water Supply	044W012	11/22/2004	-0.08	0.08	044W016	12/6/2004	0.00	0.07	0.08	0.3	Yes
M3S	04VG239	1/7/2005	1.15	0.11	04VG250	1/7/2005	1.20	0.11	0.05	0.5	Yes
Enriched Tritium											
Mud Lake Water Supply	044W012	1/14/2005	4.0	5.0	044W016	2/12/2005	2.0	5.0	2.0	21.2	Yes

Table 41 continued. Duplicate radiological analysis results (in pCi/L) for ground and surface water, fourth quarter, 2004.

Analysis/ Sample Location	Original Sample Number	Analysis Date	Concentration	± 2 SD	Duplicate Sample Number	Analysis Date	Concentration	± 2 SD	$/R_1-R_2/$	$3(s_1^2+s_2^2)^{1/2}$	Within Criteria?[1]
Technetium-99											
CFA 2	044W026	1/27/2005	3.1	0.2	044W087	1/27/2005	3.0	0.2	0.1	0.8	Yes
M3S	04VG243	1/27/2005	0.9	0.1	04VG254	1/27/2005	1.0	0.1	0.1	0.4	Yes
Strontium-90											
CFA 2	044W025	12/17/2004	0.20	0.32	044W088	12/17/2004	-0.01	0.27	0.21	1.3	Yes
M3S	04VG243	1/27/2005	0.01	0.24	04VG254	1/17/2005	0	0.22	0.01	1.0	Yes
Plutonium 238											
M3S	04VG241	2/28/2005	-0.002	0.025	04VG252	2/28/2005	0.000	0.029	0.002	0.1	Yes
Plutonium-239/240											
M3S	04VG241	2/28/2005	-0.004	0.025	04VG252	2/28/2005	0	0.029	0.004	0.1	Yes
Plutonium-241											
M3S	04VG241	2/28/2005	1.5	3.1	04VG252	2/28/2005	-0.2	3.5	0.3	14.0	Yes
Americium-241											
M3S	04VG241	3/2/2005	0.01	0.035	04VG252	3/2/2005	0.039	0.043	0.029	0.2	Yes
Chlorine-36											
M3S	04VG242	1/28/2005	-1.88	1.30	04VG253	1/28/2005	1.01	1.96	2.89	7.1	Yes

[1] $/R_1-R_2/ \leq 3(s_1^2+s_2^2)^{1/2}$

Table 42. Duplicate results (in µg/L) for metals in ground and/or surface water for the fourth quarter, 2004. Relative percent difference (RPD) is acceptable at < 20 percent. Data are presented in the table in the format of "original result/duplicate result (RPD)."

Sample Location	Sample Number	Duplicate Sample Number	Barium	Chromium	Manganese	Lead	Zinc
CFA 2	044W035	044W084	80/77 (3.8)	11/12 (8.7)	<2/<2 (0.0)	<5/<5 (0.0)	<5/<5 (0.0)
M3S (total)	04VG246	04VG257	43/46 (6.7)	15/14 (6.9)	<2/<2 (0.0)	<5/<5 (0.0)	12/13 (8.0)

Table 43. Duplicate results (in mg/L) for common ions, and nutrients in ground and/or surface water for the fourth quarter, 2004. Relative percent difference (RPD) is acceptable at < 20 percent. Data are presented in the table in the format of "original result/duplicate result (RPD)."

Sample Location	Sample Number	Duplicate Sample Number	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity as CaCO3	Total Nitrogen	Total Phosphorus
CFA 2	044W034, 035, 036	044W084, 085, 086	80/76 (5.1)	27/24 (11.8)	25/25 (0.0)	4/4 (0.0)	0.3/0.2 (55.3)[1]	107/110 (2.8)	42.5/42.6 (0.2)	128/129 (0.8)	2.96/3.01 (1.7)	0.021/0.02 (4.9)
M3S (total)	04VG244, 246, 247	04VG255, 257, 258	46/46 (0.0)	16/16 (0.0)	8.4/8.4 (0.0)	2.7/2.7 (0.0)	0.35/0.36 (2.8)	13.7/13.8 (0.7)	25.1/25.1 (0.0)	139/141 (1.4)	NR[2]	0.02/0.02 (0.0)

[1] Since the result(s) was less than five times the MDL (0.1 mg/L), the duplicate result for this analyte was acceptable at ± MDL.
[2] NR = analysis not requested.

Table 44. Duplicate results (in µg/L) for VOCs in ground and/or surface water for the fourth quarter, 2004. Relative percent difference (RPD) is acceptable at < 20 percent. Data are presented in the table in the format of "original result/duplicate result (RPD)."

Sample Location	Sample Number	Duplicate Sample Number	Carbon Tetrachloride	Trichloroethylene	All other VOC analytes
M3S	04VG248	04VG259	3.9/4 (2.5)	0.84/0.82 (2.4)	<MDL/<MDL (0.0)

Table 45. De-ionized water spike results (in µg/L) for metals in ground and surface water for the fourth quarter, 2004. A percent recovery of 100 ± 25 is considered acceptable and is recorded in parentheses (%R).

Spike Sample Number	Sample Date	Barium	Chromium	Lead	Manganese	Zinc
		Reference Spike Concentration				
		NA	20.0	20.0	5.0	20.0
044W098	10/25/2004	<2	20 (100)	19 (95)	5 (100)	20 (100)
044W101	12/1/2004	<2	20 (100)	18 (90)	5 (100)	19 (95)

Table 46. De-ionized water spike results (in mg/L) for common ions, and nutrients in ground and surface water for the fourth quarter, 2004. A percent recovery of 100 ± 25 is considered acceptable and is recorded in parentheses (%R).

Spike Sample Number	Sample Date	Calcium	Magnesium	Sodium	Potassium	Fluoride	Chloride	Sulfate	Total Alkalinity as CaCO3	Total Nitrogen	Total Phosphorus
		Reference Spike Concentration									
		10.0	10.0	10.0	10.0	1.0	20.0	20.0	NA	5	5
044W097, 098, and 099	10/25/05	10.5 (105)	10.5 (105)	9.9 (99)	9.6 (96)	1.01 (101)	19.7 (98.5)	19.2 (96)	<1	4.44 (88.8)	4.8 (96)
044W100, 101, and 102	12/1/05	10.0 (100)	10.3 (103)	10.0 (100)	10.2 (102)	1.0 (100)	19.7 (98.5)	19.2 (96)	<1	4.74 (94.8)	4.48 (89.6)

Table 47. Electret ionization chamber irradiation results (categorized as spiked samples) for fourth quarter, 2004. A percent recovery (%R) of 100 ± 25 is considered acceptable.

Electret #	Exposure Received		Gross Measured Exposure		Background[1]		Net Exposure[2]		%R
	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	(mR)	Uncertainty (mR)	(mR)	Uncertainty[3] (mR)	
S1	30.0	1.50	34.7	1.31	0.5	0.69	34.2	1.48	114
S2	30.0	1.50	36.4	1.25	0.5	0.69	35.9	1.43	120
S3	30.0	1.50	36.6	1.32	0.5	0.69	36.1	1.49	120
S4	30.0	1.50	34.3	1.35	0.5	0.69	33.8	1.52	113
S5	40.0	2.00	44.2	1.40	0.5	0.69	43.7	1.56	109
S6	40.0	2.00	43.2	1.39	0.5	0.69	42.7	1.55	107
S7	40.0	2.00	41.7	1.40	0.5	0.69	41.2	1.56	103
S8	40.0	2.00	46.6	1.29	0.5	0.69	46.1	1.46	115

[1] Four EICs were used for control measurements (counted as blanks) and were not irradiated. Background exposure, as measured by the control group, was 0.5 ± 0.69 mR.
[2] [Gross Measured Exposure] – [Background].
[3] Total propagated error.

Table 48. Air sampling field equipment service reliability (percent operational) for fourth quarter 2004. These values were calculated by dividing the number of weeks the equipment was in operation by the number of weeks in the quarter.

Station Locations	Sample Type[1]				
	PM_{10}	TSP	Radioiodine	Atmospheric Moisture	Precipitation
Onsite Locations					
Big Lost River Rest Area	NC	100%	100%	100%	100%
Experimental Field Station	NC	100%	100%	100%	NC
Sand Dunes Tower	NC	100%	100%	100%	NC
Van Buren Avenue	NC	100%	100%	100%	NC
Boundary Locations					
Atomic City	100%	100%	CP	100%	100%
Howe	NC	100%	100%	100%	100%
Monteview	NC	100%	92%	92%	100%
Mud Lake	100%	100%	CP	100%	100%
Distant Locations					
Craters of the Moon	NC	100%	100%	100%	NC
Fort Hall[2]	NC	100%	100%	100%	NC
Idaho Falls	NC	100%	100%	100%	100%

[1] NC = sample not collected at this location; CP = sample collected using the PM_{10} sampler at this location.
[2] Operated by Shoshone-Bannock Tribes.

Appendix A

Table A-1. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, fourth quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Big Lost River Rest Area	09/30/04	10/07/04	1.1	0.3	42.2	1.2
	10/07/04	10/14/04	0.8	0.2	23.5	0.9
	10/14/04	10/21/04	0.6	0.2	17.2	0.8
	10/21/04	10/28/04	0.5	0.2	17.1	0.8
	10/28/04	11/04/04	0.4	0.2	13.9	0.7
	11/04/04	11/11/04	1.0	0.2	37.0	1.2
	11/11/04	11/18/04	1.7	0.3	49.5	1.4
	11/18/04	11/24/04	0.5	0.2	32.7	1.2
	11/24/04	12/02/04	0.8	0.2	23.3	0.9
	12/02/04	12/09/04	0.4	0.2	22.7	0.9
	12/09/04	12/16/04	0.2	0.2	16.1	0.8
	12/16/04	12/23/04	0.5	0.2	24.0	0.9
	12/23/04	12/30/04	0.2	0.2	25.8	1.0
Experimental Field Station	09/30/04	10/07/04	1.3	0.3	43.1	1.3
	10/07/04	10/14/04	0.9	0.2	24.2	0.9
	10/14/04	10/21/04	0.6	0.2	17.9	0.8
	10/21/04	10/28/04	0.5	0.2	16.7	0.9
	10/28/04	11/04/04	0.5	0.2	14.1	0.7
	11/04/04	11/11/04	1.1	0.2	41.0	1.3
	11/11/04	11/18/04	1.8	0.3	52.9	1.4
	11/18/04	11/24/04	0.9	0.3	37.6	1.4
	11/24/04	12/02/04	0.6	0.2	22.3	0.8
	12/02/04	12/09/04	0.5	0.2	30.4	1.0
	12/09/04	12/16/04	0.2	0.2	17.7	0.8
	12/16/04	12/23/04	0.5	0.2	24.9	1.0
	12/23/04	12/30/04	0.4	0.2	27.0	1.0

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, fourth quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Sand Dunes Tower	09/30/04	10/07/04	1.1	0.2	36.5	1.1
	10/07/04	10/14/04	0.8	0.2	22.9	0.9
	10/14/04	10/21/04	0.4	0.1	15.2	0.7
	10/21/04	10/28/04	1.0	0.3	16.7	0.9
	10/28/04	11/04/04	0.4	0.2	13.0	0.7
	11/04/04	11/11/04	1.1	0.2	35.2	1.0
	11/11/04	11/18/04	1.3	0.2	43.7	1.2
	11/18/04	11/24/04	0.5	0.2	27.7	1.0
	11/24/04	12/02/04	0.6	0.2	27.2	0.9
	12/02/04	12/09/04	0.5	0.2	27.4	0.9
	12/09/04	12/16/04	0.2	0.2	18.1	0.8
	12/16/04	12/23/04	0.5	0.2	25.1	0.9
	12/23/04	12/30/04	0.3	0.2	26.2	0.9
Van Buren Avenue	09/30/04	10/07/04	1.1	0.3	46.0	1.3
	10/07/04	10/14/04	0.7	0.2	25.5	1.0
	10/14/04	10/21/04	0.7	0.2	18.1	0.8
	10/21/04	10/28/04	0.7	0.2	20.6	0.9
	10/28/04	11/04/04	0.6	0.2	15.5	0.8
	11/04/04	11/11/04	1.2	0.2	45.9	1.3
	11/11/04	11/18/04	1.8	0.3	54.1	1.4
	11/18/04	11/24/04	0.8	0.2	34.5	1.3
	11/24/04	12/02/04	0.5	0.2	22.2	0.9
	12/02/04	12/09/04	0.6	0.2	29.2	1.1
	12/09/04	12/16/04	0.2	0.2	19.5	0.9
	12/16/04	12/23/04	0.6	0.2	27.5	1.0
	12/23/04	12/30/04	0.4	0.2	27.0	1.0
Atomic City	09/30/04	10/07/04	1.6	0.3	48.6	1.4
	10/07/04	10/14/04	1.2	0.2	27.8	1.0
	10/14/04	10/21/04	1.0	0.2	20.5	0.9
	10/21/04	10/28/04	0.6	0.2	19.2	0.9
	10/28/04	11/04/04	0.7	0.2	17.9	0.8
	11/04/04	11/11/04	1.1	0.2	46.5	1.3
	11/11/04	11/18/04	2.1	0.3	59.2	1.5
	11/18/04	11/24/04	0.8	0.2	36.9	1.3
	11/24/04	12/02/04	0.9	0.2	22.8	0.9
	12/02/04	12/09/04	0.5	0.2	30.1	1.1
	12/09/04	12/16/04	0.4	0.3	22.8	1.2
	12/16/04	12/23/04	0.5	0.2	31.8	1.1
	12/23/04	12/30/04	0.4	0.2	29.8	1.1

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, fourth quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Howe	09/30/04	10/07/04	1.1	0.3	39.5	1.2
	10/07/04	10/14/04	1.0	0.2	24.8	1.0
	10/14/04	10/21/04	0.8	0.2	16.6	0.8
	10/21/04	10/28/04	0.5	0.2	16.4	0.8
	10/28/04	11/04/04	0.5	0.2	15.2	0.8
	11/04/04	11/11/04	0.7	0.2	28.3	1.0
	11/11/04	11/18/04	1.8	0.3	54.7	1.4
	11/18/04	11/24/04	1.1	0.3	28.0	1.4
	11/24/04	12/02/04	0.6	0.2	25.6	0.9
	12/02/04	12/09/04	0.5	0.2	27.2	1.0
	12/09/04	12/16/04	0.2	0.2	19.2	0.8
	12/16/04	12/23/04	0.6	0.2	22.1	0.9
	12/23/04	12/30/04	[2]		[2]	
Monteview	09/30/04	10/07/04	0.8	0.2	25.4	0.9
	10/07/04	10/14/04	1.2	0.2	18.8	0.8
	10/14/04	10/21/04	0.6	0.2	12.1	0.6
	10/21/04	10/28/04	0.5	0.2	13.3	0.7
	10/28/04	11/04/04	0.6	0.2	9.1	0.5
	11/04/04	11/11/04	1.2	0.2	26.4	0.9
	11/11/04	11/18/04	1.3	0.2	36.8	1.1
	11/18/04	11/24/04	0.7	0.2	20.5	1.1
	11/24/04	12/02/04	0.6	0.2	24.8	0.8
	12/02/04	12/09/04	0.7	0.2	25.7	0.9
	12/09/04	12/16/04	0.4	0.2	16.9	0.8
	12/16/04	12/23/04	0.5	0.2	21.2	0.9
	12/23/04	12/30/04	0.6	0.2	23.5	0.9
Mud Lake	09/30/04	10/07/04	1.0	0.3	38.0	1.4
	10/07/04	10/14/04	1.4	0.2	24.9	0.9
	10/14/04	10/21/04	1.0	0.3	23.2	1.3
	10/21/04	10/28/04	0.4	0.2	15.3	0.8
	10/28/04	11/04/04	0.7	0.2	13.0	0.7
	11/04/04	11/11/04	1.3	0.2	40.4	1.2
	11/11/04	11/18/04	1.7	0.3	49.6	1.3
	11/18/04	11/24/04	0.7	0.2	28.0	1.1
	11/24/04	12/02/04	0.6	0.2	25.0	0.9
	12/02/04	12/09/04	0.4	0.2	27.5	1.2
	12/09/04	12/16/04	0.3	0.2	18.4	0.8
	12/16/04	12/23/04	0.5	0.2	24.7	0.9
	12/23/04	12/30/04	0.7	0.3	24.6	1.1

Table A-1 continued. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for TSP filters for all locations, fourth quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Distant Locations						
Craters of the Moon	09/30/04	10/07/04	1.0	0.3	37.2	1.2
	10/07/04	10/14/04	1.4	0.3	19.1	0.9
	10/14/04	10/21/04	0.9	0.2	11.7	0.7
	10/21/04	10/28/04	0.5	0.2	12.9	0.7
	10/28/04	11/04/04	0.3	0.2	11.9	0.7
	11/04/04	11/11/04	0.6	0.2	28.9	1.1
	11/11/04	11/18/04	0.9	0.3	41.5	1.6
	11/18/04	11/24/04	0.6	0.2	25.5	1.1
	11/24/04	12/02/04	0.3	0.2	12.1	0.7
	12/02/04	12/09/04	0.4	0.2	15.3	0.8
	12/09/04	12/16/04	0.0	0.2	10.9	0.7
	12/16/04	12/23/04	0.2	0.2	17.8	0.8
	12/23/04	12/30/04	0.2	0.2	21.2	0.9
Fort Hall[1]	09/30/04	10/07/04	1.0	0.2	32.0	1.1
	10/07/04	10/14/04	0.9	0.2	19.5	0.8
	10/14/04	10/21/04	0.7	0.2	12.5	0.8
	10/21/04	10/28/04	0.6	0.2	13.5	0.7
	10/28/04	11/04/04	0.5	0.2	10.9	0.6
	11/04/04	11/11/04	1.2	0.2	24.3	0.9
	11/11/04	11/18/04	1.9	0.3	38.3	1.2
	11/18/04	11/24/04	0.6	0.2	20.5	0.9
	11/24/04	12/02/04	0.3	0.1	12.2	0.6
	12/02/04	12/09/04	0.9	0.2	24.0	0.9
	12/09/04	12/16/04	0.5	0.2	13.4	0.7
	12/16/04	12/23/04	0.9	0.2	16.9	0.8
	12/23/04	12/30/04	0.7	0.2	19.7	0.8
Idaho Falls	09/30/04	10/07/04	0.7	0.2	38.7	1.2
	10/07/04	10/14/04	0.8	0.2	24.4	0.9
	10/14/04	10/21/04	0.7	0.2	15.0	0.7
	10/21/04	10/28/04	0.5	0.2	17.1	0.8
	10/28/04	11/04/04	0.4	0.2	14.3	0.7
	11/04/04	11/11/04	1.3	0.2	37.4	1.1
	11/11/04	11/18/04	1.4	0.3	43.5	1.2
	11/18/04	11/24/04	0.8	0.2	28.2	1.1
	11/24/04	12/02/04	0.4	0.2	16.3	0.7
	12/02/04	12/09/04	0.7	0.2	31.2	1.1
	12/09/04	12/16/04	0.1	0.2	18.2	0.8
	12/16/04	12/23/04	0.8	0.2	25.2	1.0
	12/23/04	12/30/04	0.5	0.2	23.9	0.9

[1] Operated by Shoshone-Bannock Tribes.
[2] No sample due to equipment failure.

Appendix B

Table B-1. Weekly concentrations (in 1 x 10^{-3} pCi/m^3) for gross alpha and gross beta analyses for PM_{10} air samples for all locations, fourth quarter, 2004.

Sample Location	Collection Date		Gross Alpha		Gross Beta	
	Start	Stop	Concentration	± 2 SD	Concentration	± 2 SD
Atomic City	09/30/04	10/07/04	1.5	0.5	63.5	2.2
	10/07/04	10/14/04	0.9	0.4	36.2	1.7
	10/14/04	10/21/04	0.7	0.3	24.5	1.4
	10/21/04	10/28/04	1.2	0.5	26.3	1.8
	10/28/04	11/04/04	0.8	0.4	22.9	1.3
	11/04/04	11/11/04	1.6	0.4	66.1	2.2
	11/11/04	11/18/04	2.4	0.5	79.6	2.4
	11/18/04	11/24/04	1.0	0.4	51.0	2.1
	11/24/04	12/02/04	0.7	0.3	31.6	1.4
	12/02/04	12/09/04	0.7	0.4	47.8	2.3
	12/09/04	12/16/04	0.1	0.4	28.9	1.5
	12/16/04	12/23/04	0.7	0.3	42.8	1.8
	12/23/04	12/30/04	0.2	0.4	44.2	1.8
Mud Lake	09/30/04	10/07/04	1.9	0.5	60.9	2.1
	10/07/04	10/14/04	1.1	0.4	40.7	1.7
	10/14/04	10/21/04	0.8	0.3	23.3	1.4
	10/21/04	10/28/04	0.8	0.3	23.3	1.4
	10/28/04	11/04/04	0.5	0.3	19.6	1.2
	11/04/04	11/11/04	2.1	0.6	68.3	2.7
	11/11/04	11/18/04	2.7	0.5	79.5	2.4
	11/18/04	11/24/04	1.3	0.4	52.4	2.1
	11/24/04	12/02/04	0.9	0.3	45.6	1.7
	12/02/04	12/09/04	0.6	0.3	46.3	1.8
	12/09/04	12/16/04	0.3	0.4	28.7	1.5
	12/16/04	12/23/04	1.4	0.4	45.6	1.8
	12/23/04	12/30/04	0.4	0.4	39.9	1.7

Appendix C

Table C-1. Results for additional electret locations, fourth quarter, 2004.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
Dubois	16.8	1.9
Hamer	20.5	2.0
Sugar City	24.4	2.2
Blue Dome	13.6	1.8
TAN	19.9	2.0
ICPP I	19.5	1.9
NRF	20.1	2.0
EBR II	19.8	2.0
TRA	19.8	2.0
Grid 3	19.4	1.9
PBF	16.8	1.9
CFA	19.7	2.0
RWMC	19.1	1.9
Roberts	22.6	2.1
Kettle Butte	18.1	2.1
Blackfoot	16.0	1.8
Taber	16.0	1.8
Aberdeen	20.0	2.2
Minidoka	16.6	1.9
Arco	18.7	1.9
Richfield	19.1	2.0
EBR I	17.1	1.9
Reno Ranch	13.3	1.8
Rover Rd. 2.9mi	19.7	2.1
Rover Rd. 4.9mi	20.7	2.2
Rover Rd. 6.3mi	20.2	2.1
Rover Rd. 6.8mi	22.5	2.2
Rover Rd. 8.8mi	19.8	2.1
Rover Rd. 10.8mi	20.6	2.2
Rover Rd. 15.4mi	21.4	2.2
Rover Rd. 17.4mi	23.0	2.2
MP1 - 22/33	16.5	1.9
MP3 - 22/33	18.6	1.9
MP5 - 22/33	16.9	1.9
MP7 - 22/33	17.5	1.9
MP9 - 22/33	15.3	1.8
MP23 - 33	17.0	2.1
MP25 - 33	18.2	2.1

Table C-1 continued. Results for additional electret locations, fourth quarter, 2004.

Sample Location	Net Corrected Exposure (uR/h)	± 2 SD (uR/h)
MP27 - 33	23.9	2.3
MP29 - 33	19.2	2.1
MP31 - 33	20.1	2.2
MP33 - 33	21.2	2.2
MP35 - 33	19.1	2.1
MP37 - 33	18.0	2.1
MP39 - 33	23.5	2.3
MP41 - 33	20.7	2.2
MP43 - 33	23.5	2.3
Mud Lake - Bank of Commerce	21.8	2.2
MP1 - Lincoln Blvd	19.8	2.0
MP5 - Lincoln Blvd	21.7	3.5
MP7 - Lincoln Blvd	20.8	2.0
MP9 - Lincoln Blvd	21.3	2.0
MP11 - Lincoln Blvd	17.4	1.9
MP13 - Lincoln Blvd	19.8	2.0
MP15 - Lincoln Blvd	22.7	2.0
MP17 - Lincoln Blvd	22.7	2.1
MP19 - Lincoln Blvd	21.7	2.0
MP21 - Lincoln Blvd	21.4	2.0
MP264 - 20	18.8	1.9
MP266 - 20	17.0	1.9
MP268 - 20	17.6	1.9
MP270 - 20	20.0	2.0
MP272 - 20	18.0	1.9
MP274 - 20	15.7	1.8
MP276 - 20	18.0	1.9
MP270 - 20/26	22.7	2.1
MP268 - 20/26	19.0	1.9
MP266 - 20/26	20.6	2.0
MP263 - 20/26	20.5	2.0
MP261 - 20/26	19.0	1.9
MP259 - 20/26	18.0	1.9
Howe Fence-line 1.4mi	19.0	2.1
Howe Fence-line 2.3mi	19.9	2.2
Howe Fence-line 4.2mi	17.0	2.1
Howe Fence-line 6.5mi	19.9	2.2
Howe Fence-line 8.6mi	18.3	2.1
Howe Fence-line 9.7mi	18.3	2.1
Howe Met. Tower	17.7	1.9

Appendix D

Table D-1. List of volatile organic compounds (VOCs) analyzed for water verification samples, fourth quarter, 2004. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	MDC
Benzene	0.5
Carbon tetrachloride	0.5
Chlorobenzene	0.5
1,4-Dichlorobenzene	0.5
1,2-Dichlorobenzene	0.5
1,2-Dichloroethane	0.5
1,1-Dichloroethene	0.5
cis-1,2-Dichloroethene	0.5
trans-1,2-Dichloroethene	0.5
1,2-Dichloropropane	0.5
Ethylbenzene	0.5
Methylene Chloride	0.5
Styrene	0.5
Tetrachloroethylene (PERC)	0.5
Toluene	0.5
1,2,4-Trichlorobenzene	0.5
1,1,1-Trichloroethane	0.5
1,1,2-Trichloroethane	0.5
Trichloroethylene	0.5
Vinyl chloride	0.5
Xylenes (total)	0.5
Bromodichloromethane	0.5
Dibromochloromethane	0.5
Bromoform	0.5
Chloroform	0.5
Bromobenzene	0.5
Bromochloromethane	0.5
Bromomethane	0.5
n-Butylbenzene	0.5
sec-Butylbenzene	0.5
tert-Butylbenzene	0.5
Chloroethane	0.5
Chloromethane	0.5
2-Chlorotoluene	0.5
4-Chlorotoluene	0.5
1,2-Dibromo-3-chloropropane (DBCP)	1.0
1,2-Dibromoethane (EDB)	0.5

Table D-1 continued. List of volatile organic compounds (VOCs) analyzed for water verification samples, fourth quarter, 2004. Minimum detectable concentrations (MDC) are expressed in µg/L.

Analyte	MDC
Dibromomethane	0.5
1,3-Dichlorobenzene	0.5
Dichlorodifluoromethane	0.5
1,1-Dichloroethane	0.5
1,3-Dichloropropane	0.5
2,2-Dichloropropane	0.5
1,1-Dichloropropene	0.5
cis-1,3-Dichloropropene	0.5
trans-1,3-Dichloropropene	0.5
Hexachlorobutadiene	0.5
Isopropylbenzene	0.5
p-Isopropyltoluene	0.5
Methyl Tert Butyl Ether (MTBE)	1.0
Naphthalene	1.0
n-Propylbenzene	0.5
1,1,1,2-Tetrachloroethane	0.5
1,1,2,2-Tetrachloroethane	0.5
1,2,3-Trichlorobenzene	1.25
Trichlorofluoromethane	0.5
1,2,3-Trichloropropane	0.5
1,2,4-Trimethylbenzene	0.5
1,3,5-Trimethylbenzene	0.5